DOCUMENT RESUME

04256 - [B3434698]

Potential Effects of a National Mandatory Deposit on Beverage Containers. PAD-78-19; B-166506. December 7, 1977. 59 pp. + 2 appendices (22 pp.).

Report to the Congress; by Elmer B. Staats, Comptroller General.

Issue Area: Environmental Protection Programs: Solid Waste Disposal and Resource Recovery (2206).
Contact: Program Analysis Div.
Budget Function: Natural Resources, Environment, and Energy: Pollution Control and Abatement (304).
Organization Concerned: Environmental Protection Agency; Department of Energy; Council on Environmental Quality.
Congressional Relevance: House Committee on Interstate and Foreign Commerce; Senate Committee on Commerce, Science, and Transportation; Congress.
Authority: 40 C.F.R. 244.

Proposals have been introduced in Congress since 1970 to require refundable deposits on all beverage containers in order to reduce litter and waste. A mandatory deposit system would change the national beverage system from about 25% to 100% deposit containers. Findings/Conclusions: Some changes expected to result from required deposits on beverage containers are: reductions in litter and solid waste; a rise in empty container handling costs for retailers, wholesalers, and beverage producers; and increased income for industry due to failure of consumers to return all containers. Changes which would be dependent on the number of new containers manufactured are reductions in raw material consumption, energy use, and system costs for containers, and increases in system costs for using more refillable bottles. There would be increases in capital and labor costs, but these would be more than offset by the decrease in new container purchases and retained deposits. After the initial capital costs, there would be a considerable decrease in costs. There would probably be decreases in bottle production which would cause job losses, but these would be offset by increased employment in beverage industries and retail stores. Recommendations: If legislation for a mandatory deposit on beverage containers is enacted, it should include: a deposit imposed on all beverage containers, a lead-in period for implementing the law to help industry convert its facilities, funds to inform the public about the need to return containers, enhanced access to retraining programs and unemployment compensation for areas with employment problems resulting from the legislation, some money from unredeemed deposits placed in a fund for municipalities to clean up litter and solid waste, analyses of effects after implementation, and a mechanism to encourage can recycling. (Author/HTW)

REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Potential Effects Of A National Mandatory Deposit On Beverage Containers

Refundable deposits on beverage containers--cans and bottles--would change the national beverage system from about 25-percent deposit containers to 100-percent deposit containers.

This four-fold increase in deposit coverage would reduce litter and solid waste. Other changes, such as on raw material use and energy, would depend on the extent to which refillable bottles replaced one-way bottles and cans.

Industry costs would definitely include extra effort for handling and storing the four-fold increase in deposit containers. Other costs, such as increased capital for filling lines and increased wages, would depend on the change from one-way containers to refillable bottles which are relatively cheaper.

PAD-78-19

DECEMBER 7, 1977

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-166506

To the President of the Senate and the
Speaker of the House of Representatives

This report describes the potential effects of national legislation which would mandate refundable deposits on beverage containers. The effects would occur in many environmental and economic areas, with potential disruptions in the beverage delivery system one of the major costs. Potential benefits would mostly be in the areas of litter, solid waste, and energy use.

Mandatory beverage container deposits was identified as a review area under our environmental protection issue area. Implementation of a mandatory deposit system at the national level has been touted as one part of a solution to solid waste disposal and materials recycling problems. Most of the industries which would bear the brunt of the business adjustment of an all-deposit system oppose a mandatory deposit system at any level.

We analyzed and reported on this issue because of the claims and counter-claims which have become a part of this controversial proposal. We believe that objective analysis will greatly aid the Congress as it considers this issue and related proposed solutions to the Nation's solid waste disposal, materials recycling, and environmental problems.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Legislative Reorganization Act of 1970 (88 Stat. 297).

We are sending copies of this report to the Acting Director, Office of Management and Budget; Department of Energy; Environmental Protection Agency; Department of Commerce; and Council on Environmental Quality.

Comptroller General
of the United States

D I G E S T

Proposals for refundable deposits on all beverage containers have been introduced in the Congress since 1970. There is much disagreement about both the costs and benefits of such legislation. This study analyzes the effects of a national mandatory deposit system on the environment, the economy, and the consumer. It does not compare costs of a mandatory deposit law to other means of achieving similar purported benefits.

Some effects of a mandatory deposit system are fairly certain. They depend on the change from a beverage system which, before legislation, has 25-percent deposit containers, to a system which would have 100-percent deposit containers. These changes are:

--Litter and solid waste. Reductions would be expected in beverage container litter, total litter, and postconsumer solid waste.

--System costs to handle returned containers. Retailers, wholesalers, and beverage producers would be handling about four times the deposit containers they do today. Empty container handling costs would rise.

--Deposits not claimed by the consumer. As not all containers would be returned for deposit refund, industry's income would rise. Again, this is due primarily to the increase in deposit coverage from 25 percent to 100 percent.

In addition to the fairly certain effects noted above, there are other changes which could occur in lesser or greater amounts depending on the number of new containers manufactured, such as

--reduced raw material consumption,

--reduced energy use,

--reduced system costs for containers, and

--increased system costs for using more refillable bottles.

Because industry would be free to select how it wished to respond to a mandatory deposit law, their decisions would determine the size of the above changes.

GAO calculated the economic costs of changing to a mandatory deposit system from a continuation of the existing system. The change would result in a net decrease in economic costs, even during a changeover to a radically different container mix, or the ratio of bottles to cans. There would be increases in capital costs (for new filling and distribution equipment) and in labor costs. These increases would, however, be more than offset by the decrease in new container purchases and the increase in income from retained deposits. This would result in a net decrease in costs but consumer prices would not decrease unless breweries and bottlers passed most of their cost savings forward. (See ch. 4.)

After the changeover there would be continuing cost differences each year. These would basically be continuing the trends established during the changeover, except for capital costs. The major cost for new capital would occur during the changeover; the annual costs after the new equipment was in place would not be very different from the present system. Maintaining a deposit system once it was in place would be considerably cheaper than continuing present trends.

A mandatory deposit law would probably cause some decrease in bottle production and may cause a decrease in can production as well. This would involve some job losses in container manufacturing and related industries. These losses would be more than offset by increased

employment in the beverage industries and retail stores. The net change for all industries would range from about 20,000 jobs to about 32,000.

AGENCY COMMENTS

The Federal Energy Administration (now part of the Department of Energy), the Environmental Protection Agency, and the Council on Environmental Quality agreed with most of the report. The Department of Commerce would like the Congress to consider mandatory deposits as but one of several interrelated options for solving the Nation's solid waste disposal and materials recycling problems. Commerce also notes that the GAO assumptions seem optimistic.

GAO agrees that a mandatory deposit proposal is but one of the options available, emphasizing that it set out to analyze just this one option. The bases for GAO assumptions are carefully explained in the report and are minimum, not optimistic, values.

OTHER COMMENTS

Comments from industry associations, environmental groups, and individuals were split basically between industry--generally a negative reaction--and the others--generally positive. Because of the great quantity of material with which industry provided us, we dealt with major and common criticisms in summary form. (See app. V.) Industry groups criticized GAO's principal assumptions as too optimistic. They further believe that the disruptions and increased costs resulting from a mandatory deposit law would far outweigh possible environmental benefits. The GAO comments are presented in appendix V.

RECOMMENDATIONS

If legislation for a mandatory deposit on beverage containers is enacted, it should include the following:

Tear Sheet

--A deposit imposed on all beverage containers, since benefits result when as many containers as possible are returned for reuse.

--A lead-in period for implementing the law to help industry convert its facilities to the new system with fewer operating problems.

--Funds to inform the public about the need to return containers.

--Enhanced access to retraining programs and unemployment compensation for areas with employment problems resulting from the legislation.

--Some money from unredeemed deposits placed in a fund for municipalities to clean up litter and solid waste.

--Measurements and analyses of effects after implementation so that the responsible agency is informed of the program's effectiveness and need for any changes.

--Mechanism to encourage can recycling.

Contents

ABBREVIATIONS

BTU	British thermal unit
EPA	Environmental Protection Agency
FEA	Federal Energy Administration
USBA	U.S. Brewer's Association

CHAPTER 1

INTRODUCTION

In 1960, the average American threw away 75 beverage containers. By 1977, the number will have grown to 370. This almost five-fold increase is not only the result of a burgeoning American appetite for soft drinks and beer, but also reflects the change in containers used for these beverages. As recently as 1960, Americans purchased their beer and soft drinks mostly in refillable glass bottles which carried a refundable deposit. Today over 70 percent of these beverages are sold in no-deposit glass or metal containers which are used once and discarded.

The trend toward one-way packages 1/ in the beverage industry has brought with it both praise and criticism. The praise centers around the convenience which one-way containers provide the consumer; the initial criticism was a reaction to the obvious increase in beverage container litter. As early as 1953 in Vermont, the sale of one-way glass bottles was banned.

Since that time innumerable bills on this subject have been introduced into legislative bodies at all levels of government. For the most part, these bills are intended to encourage consumers not to litter their beverage containers by imposing a mandatory deposit on all beverage containers, including one-way bottles and cans.

The rationale behind a mandatory deposit system is economic in nature. The consumer of beverages would be required to pay some minimum amount per container. When the container is returned to the retail store, the deposit would be refunded. The consumer, by returning the container, would be reacting to the financial incentive, thus making the can or bottle available for multiple use (refilling) or recycling (remelting and manufacture into containers again).

The debate on mandatory deposit legislation continues and the issues have broadened. Proponents of mandatory deposit legislation view the present system as a symbol of a

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1/Beverage containers designed for one use have been described by many adjectives: throw-away; no-deposit, no-return; disposable; one-way; non-returnable. We will use "one-way" in this report when we mean containers designed for a single use.

society that litters and wastes too much, uses energy excessively and depletes scarce resources needlessly. In their view, a mandatory deposit system would help to eliminate these negative aspects of the present predominately one-way system. A mandatory deposit law would serve as a different symbol, showing how America can conserve its resources without diminishing its quality of life.

Opponents counter that the present beverage system is a direct response to consumer's demands. Any deposit legislation would interfere with the orderly working of the market system. They contend that our lifestyle would be deleteriously affected by such a law through higher beverage costs, disruptions in service, and a loss of both convenience and local brands. Also, they maintain that a mandatory deposit system would not reduce litter or solid waste very much nor conserve energy.

The two opposing groups agree in principle that the Nation's resources should be utilized in the most efficient manner possible. They do not agree on what most efficient means, how much the government should intervene, or which mechanisms should be used.

The proponents believe that the producers and sellers of goods should bear some responsibility for the waste generated by their products and that the consumer should be more directly aware of the costs of consuming and disposing of one-use packaging. The opponents of mandatory deposits view such a national mandatory deposit system as only a partial solution to the problems of solid waste. In fact, such legislation is seen as a hindrance to implementation of municipal recycling programs because it removes valuable cans from the waste system.

As of late 1977, four States have enacted some type of mandatory deposit legislation 1/ and a national mandatory deposit law has been suggested. This report was prepared to assist the Congress in its consideration of such a proposal. Although many studies on the subject have been published, they tend to concentrate on only one aspect of such a system or, if they consider all aspects of the system, they do so only at the State or local level. This report assesses the potential effects of a national law on the three major areas: environment, economy, and consumer. The analysis compares

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1/Oregon, Vermont, Maine, and Michigan.

the potential effects of a national mandatory deposit system to the potential effects of a continuation of the present system.

The purported benefits of a mandatory deposit system on the national level are not easily translated into monetary terms; therefore, comparisons between the unquantifiable benefits and the costs, which usually can be quantified, were not made in this study. For example, a reduction in beverage container litter has an aesthetic benefit which defies a monetary value. The adaptation of the beverage and production systems to a mandatory deposit law can be put into dollars and cents terms. Without an objective standard between costs and aesthetics, we believe comparisons are not analytically sound.

This report depends heavily on existing studies for the data used in the economic analysis. We used the Federal Energy Administration's (FEA's) recent report 1/ on mandatory deposits as the baseline for beverage consumption. The information in the FEA model on the historical trends in consumption was updated to include 1974-76 data. We culled other necessary data and information from many reports and checked the data through primary sources and interviews with industry, Government, and academic sources.

1/Federal Energy Administration, "Energy and Economic Impacts of Mandatory Deposits," Final Report, Office of Energy Conservation and Environment, September 1976.

CHAPTER 2

BACKGROUND AND ASSUMPTIONS

BACKGROUND

Late in the 1800s, beer and soft drinks were available almost entirely at local taverns or drug stores. Beer was stored in kegs, soft drinks in dispensers, and both were served for consumption on the premises. Both beverages gradually became more available in bottles that were filled at local breweries or soft drink bottlers and sold for home consumption. Until late in the 1940s, beer was packaged almost totally in refillable glass bottles, and most soft drinks were sold in refillables through the 1950s.

During World War II, beer was shipped in cans and one-way bottles to the Armed Forces. In the postwar period, the can industry and its chief supplier, the steel industry, began to expand their fledgling beverage market. The can and steel industries joined in a concerted, effective promotion of the beverage can. The aluminum industry began promoting beverage cans in the 1960s.

Successful competition from beverage cans reduced the glass container share of the market. The glass industry marketed some one-way bottles in the 1940s and 1950s, but not until a lightweight, one-way bottle was introduced in 1959 did the glass industry respond competitively to the can industry with their one-way container.

The beer industry quickly adopted the one-way can. Table 1 shows this change from refillable bottles to one-way containers. The brewing industry states that the rapid switch to one-way containers was due to consumer acceptance of its convenience. Others interpret the switch as a result of dual pressures from the metal can industries to sell containers and from the retail stores to reduce handling of returned containers. Larger breweries, it is said, were able to maintain sales growth in the more expensive one-way container because of large advertising campaigns and beer drinkers' seeming indifference to somewhat higher prices. Whatever the reasons for the growth of the one-way container in the beer industry, the takeover is almost complete; now the refillable bottle is found mostly at bars.

The soft drink industry responded differently to the container industry's new product lines than did the brewers. It transformed its delivery system more slowly and has not yet reached the same level of one-way containers. Table 2 shows this industry's adoption of the one-way can and bottle.

Table 1

Beer Market by Container Type (note a)
(12 oz. equivalents)

	Refillable bottles	One-way bottles	Cans
	(percent)		
1947	85.9	3.0	11.0
1951	68.6	10.5	20.8
1955	59.4	7.7	32.9
1959	53.0	8.0	39.0
1963	46.0	16.3	37.7
1967	34.6	21.4	44.0
1971	23.5	20.9	55.6
1975 (note b)	15.5	24.4	60.1

a/FEA study, table B-2.

b/1975 from Department of Commerce and industry publications.

Several reasons help explain the higher share of refillable bottles in the soft drink industry as compared to the beer industry--38 percent versus 16 percent in 1975. One factor is the exclusive franchise arrangement between the soft drink syrup supplier and the local bottler. Traditionally, these franchises have covered small areas, reducing the problem of recovering empty refillable bottles. Also, the soft drink product itself hampered early acceptance of metal cans. Soft drinks are more acidic than beer and are bottled under more pressure, so heavy glass bottles were preferred to early steel cans. The can first made an inroad into the soft drink refillable bottle market with the local or store brands of soft drinks. Individually, local bottlers didn't have the necessary capital to purchase soft drink canning lines, so they began to collectively purchase can filling lines or contracted with established canners to meet store brand competition. In addition, several leading soft drink brands have distinctive bottle shapes that are not available in metal cans.

Table 2

Soft Drink Market by Container Type (note a)
(12 oz. equivalents)

	Refillable bottles	One-way bottles	Cans
	(percent)		
1947	100.0	-	-
1951	99.8	0.2	-
1955	97.0	1.2	1.8
1959	96.1	1.3	2.5
1963	88.7	3.3	8.0
1967	64.9	12.8	22.3
1971	39.3	26.9	33.8
1975 (note b)	37.9	29.1	33.0

a/FEA study, table B-7, B-16.

b/1975 from Department of Commerce and industry publications.

The present trend indicates that the one-way container will probably take over more and more of the beverage container market. One recent prediction was that the one-way container would grow to 97 percent of the packaged beer market and increase to 63 percent of the soft drink market by 1985. Most experts believe that the one-way can or bottle will remain the dominant beverage container if the Government does not intervene.

Framework of the beverage system

The industries which contribute to bringing the beverage to the consumer can be classified into three main groups:

--Container producers.

--Beverage producers and distributors.

--Retail outlets.

In addition, there are the industries which supply goods and services to these three groups which can be called indirect industries.

The container group includes glass and metal container producers. Glass container producers form their own molten glass, so they receive the raw materials and produce finished

glass containers at one location. There are about 120 glass container plants in the United States owned by 40 companies. The four largest manufacturers account for close to 60 percent of the production. About half the industry-wide glass container production is for beverage containers.

Metal can producers, in comparison, purchase their raw material--sheets of aluminum or steel called stock--from the primary metal producers, although some aluminum companies also make cans. These sheets are formed into aluminum and steel cans at 400 plants. The four largest companies produce about two-thirds of total can output. Beverage containers constitute about half the industry's annual production, but breweries are making a sizable inroad by producing cans for their own use.

Breweries and bottlers constitute the second group, beverage producers. The number of breweries was just about 100 in 1975, down from 300 in the 1950s. The five largest firms accounted for almost 70 percent of total beer sales. The soft drink bottlers, usually independent franchises who purchase syrup from a national firm, numbered about 2,300 in 1975, down from 4,500 in 1960. Two national syrup firms control about 55 percent of the soft drink market.

The beverage producers market a large share of their beer and soft drink production in containers or packages. Breweries and bottlers use refillable bottles, one-way bottles, and cans to package their product. The one-way containers are shipped from the container producers as needed, and are rinsed and filled at the beverage plant. The returnable bottles are received from wholesalers/retailers, stored, and washed and rinsed as needed. The process machinery to fill the beer or soft drink into the containers is called the filling line, but the bottle filling lines are not interchangeable with the can filling lines.

The connection between the beverage producers and the retail outlets is the wholesaler-distributor, who is also part of the beverage industry. Breweries usually sell their product to beer wholesalers, who then distribute the goods to bars, restaurants, and retail food/beverage outlets. There were about 5,000 of these beer wholesalers in 1975. Soft drinks are usually distributed directly from the bottler to the retail establishments, so the soft drink wholesale warehouse is contained in the bottling firm.

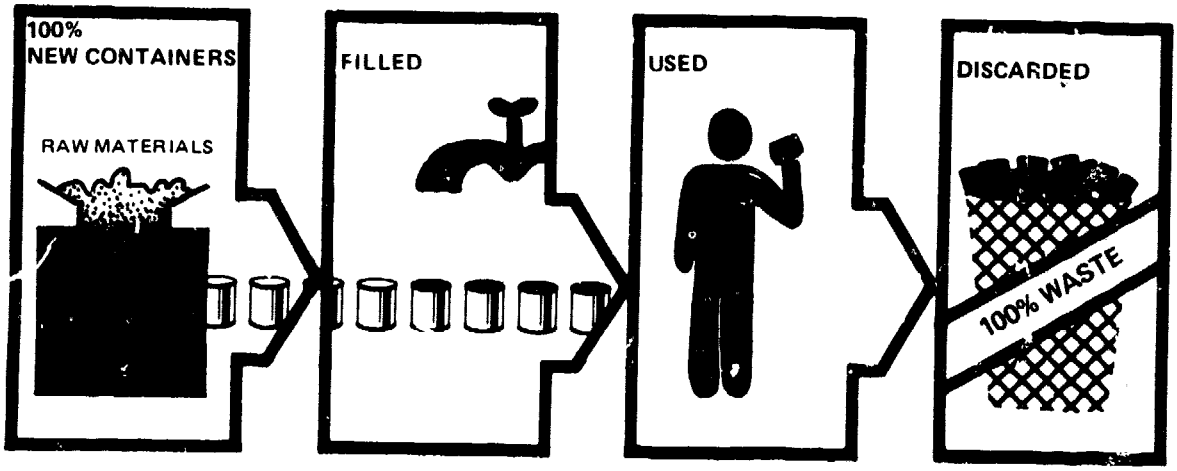
The last major group is the retail outlet. Most of the packaged beer and soft drinks--about 70 to 80 percent--are

sold by the 190,000 retail food stores in the United States. Approximately 10 percent of retail stores' volume is soft drinks and beer.

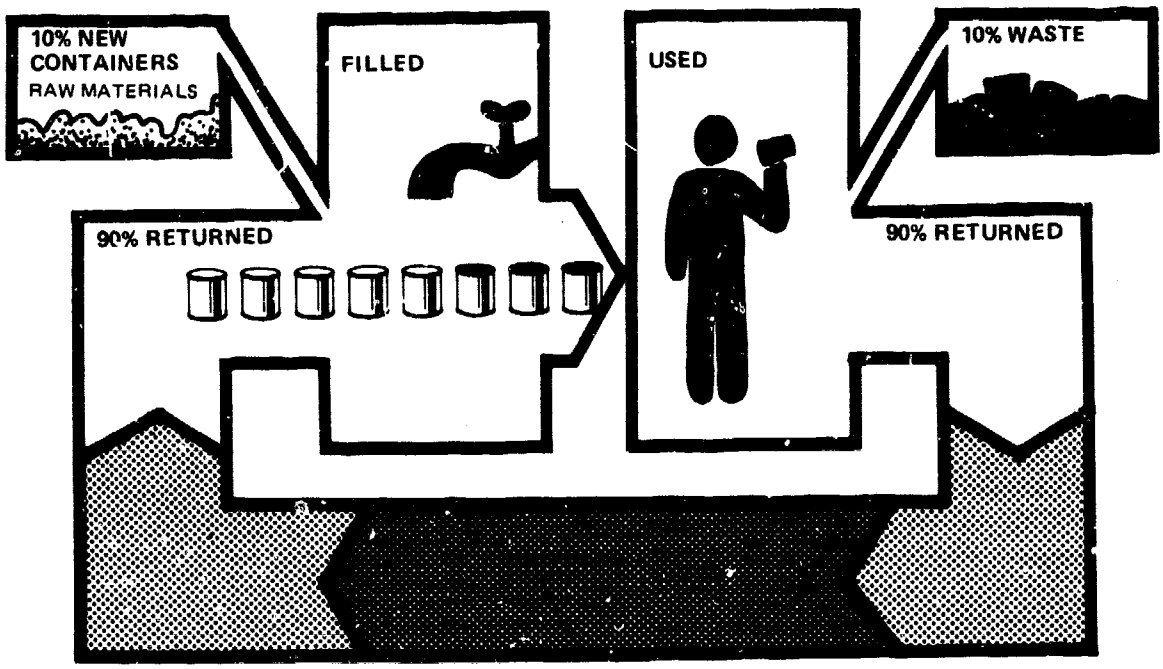
There are many indirect industries which supply the industries in the beverage system. Several major ones are mining, transportation, cardboard packaging, and advertising.

The beverage system is a complex network of interdependent industries. A mandatory deposit law would affect the three major groups of industries in different ways. A depiction of two simple beverage systems may help to indicate where the effects might occur and what types of tradeoffs are involved.

The first example is the one-way beverage system. If only this system were used, each beverage consumed would require a new container. There would be no refilling of any containers.



The second example is that of the totally refillable beverage system. If this system were used, all containers would be reused until they were damaged or not returned. The only new containers needed would be those to replace the containers not returned. In the following illustration, the beverage system is a closed loop except for replacing 10 percent of the containers which are assumed not to be returned by the consumer.



However, the real world is not as simple as either hypothetical beverage system. The existing beverage system uses both one-way and refillable containers and will probably be using both in 1985. All the one-way containers can be recycled so that some part of these discarded containers could, as a result of a resource recovery system, be used to make new containers. The two examples above merely portray the extremes, with the system which would evolve as a result of a mandatory deposit system falling somewhere between.

Any beverage system has its own effects on the environment, business, and the economy. These effects depend on the change in number and type of containers manufactured. For example, if fewer one-way containers were used to deliver beverages, container raw material use would be less.

The arrows in the diagrams indicate physical movement, so that some of the energy changes are indicated. Under a refillable system, fewer new containers would be delivered from container factories to brewery or bottler, but old containers would have to be brought back from point of consumption to point of reuse. The net transportation energy difference would depend primarily on container weight, distance transported, and net change in the distribution fleet. Other energy changes would result from fewer containers being manufactured and increased washing.

The economic effect on the firms also can be implied from the diagrams. For instance, in the one-way system, the filling operations use only new containers. This involves certain supplier-user relationships as well as filling equipment designed for only one-way containers. The refillable system requires that the filling operations receive both old and new containers which have different storing, cleaning, and handling requirements. This implies different labor and capital requirements.

ASSUMPTIONS

Before any comparison of beverage systems could be made, two models were needed:

--One based on a beverage system which would operate as the present system does.

--One based on a beverage system which would require a mandatory deposit on beverage containers.

We will compare the two systems for the years 1981 and 1985.

The most important point in discussing these systems is that they can be used only to determine relative differences between the two systems. Any estimates made from the models, such as 1985 energy requirements for a mandatory deposit system, or number of aluminum cans in the baseline are not precise numbers to be used as certain effects from either system. Rather, the numbers are significant only when viewed together so that their relative differences can be compared.

We used the methodology of the FEA study baseline beverage consumption projections, updating the model with data from 1974-76, for our beverage system which would operate as the present system does. There is, of course, uncertainty associated with any projections of what the beverage industry will be like through 1985. Unforeseen developments--a switch to beer by wine and liquor consumers, or a switch from premixed, carbonated soft drinks to powdered drinks--could radically change the future beverage consumption pattern even without a mandatory deposit. The baseline numbers which are used in this report are presented in table 3.

The mandatory deposit beverage system was developed by estimating the effect of the deposit on the baseline system. We assumed that the deposit would be a minimum

of 5 cents on all beverage containers, both metal and glass. The behavior of customers towards the refundable deposit on previously one-way containers then becomes a crucial estimate. The beverage industry's response to a deposit on every container is also crucial. We identified three areas where assumptions about the combined influence of consumers and business must be made.

Table 3

Baseline Forecasts (No Deposit)
(billions of 12 oz. equivalents)

	1977	1981	1985
Total beverage fillings	106.4	122.2	131.5
Soft drinks	58.9	67.3	71.3
Beer	47.4	54.9	60.2
Fillings into refillables	29.0	29.3	27.8
Soft drinks	23.2	25.5	26.0
Beer	5.8	3.8	1.8
One-way bottles	25.9	28.8	29.6
Soft drinks	15.0	16.5	16.8
Beer	10.9	12.4	12.8
Steel cans	31.6	35.9	39.2
Soft drinks	16.6	20.2	22.8
Beer	14.9	15.7	16.4
Aluminum cans	20.0	28.2	34.9
Soft drinks	4.2	5.1	5.7
Beer	15.8	23.1	29.2

Source: FEA Report, Appendix B. Updated by GAO with 1974-76 beverage consumption data.

The critical areas are beverage sales, the return rate on deposit containers, and the container mix. 1/ We had to make major assumptions about each of these areas. The reasons for our assumptions of no change in sales, relatively high-return rates, and no certainty in the container mix after implementation of a mandatory deposit law are set out below.

1/Container mix refers to the number of containers--aluminum and steel cans and one-way and returnable bottles--the beverage industry uses to package its product.

Future beverage sales

For this report we have assumed that a mandatory deposit would not change total beverage sales from those levels predicted in FEA's baseline; that is, a required deposit would not alter beverage sales from the levels estimated for the current, no-deposit system. The rationale for this assumption is:

--Oregon has had a mandatory deposit system for 5 years, and beverage sales have not decreased. Sales changed very little the first year of the system, but have since resumed per capita growth. (See apps. I and V.)

--By assuming the same sales levels between the baseline (or current system) and a hypothetical mandatory deposit system, we analyze the differences between the systems instead of the differences between sales levels.

Future beverage container return rates

On the basis of past and present experience, we assumed that a comprehensive national mandatory deposit law would result in at least a 90-percent return rate, equivalent to an average of 10 fillings, for refillable bottles. A mandatory deposit system is designed to encourage the return of beverage containers through economic incentives. The percentage of containers returned, or return rate, is important because a refillable container not returned is added to litter or solid waste and requires a new container to take its place.

We examined two situations to arrive at our assumption about bottle return rates. The first was the past (1947-75) national experience with return rates on refillable bottles. 1/ The return rate for beer bottles was about 95 percent, which equals 20 fillings, as late as the mid-60s, with soft drinks at 93 percent or 14 fillings at that time. 2/ In 1975, the

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1/The estimating tool was a stock inventory model from FEA study. We updated the model with 1974 and 1975 container data.

2/Fillings are calculated by the formula $\frac{1}{1-r}$ where r equals the percentage of containers returned--the return rate. With a 95 percent return rate the number of fillings often called trips, would be $\frac{1}{1-.95}$, or 20.

beer industry packaged 15 percent of its product in refillable bottles, with an estimated return rate of 93 percent. The same year the soft drink industry used refillable bottles for 38 percent of its product with the return rate estimated at 91 percent.

Table 4

Market Share for Refillable Bottles, and Return Rates

	Soft drinks		Beer	
	Return rate	Refill share (percent)	Return rate	Refill share (percent)
1947	.959	100.0	.969	85.9
1951	.953	99.9	.965	68.7
1955	.948	98.4	.962	59.4
1959	.945	97.7	.960	53.0
1963	.939	88.7	.956	46.0
1967	.923	64.9	.946	34.6
1971	.911	39.3	.939	23.5
1975	.905	37.9	.927	15.5

Source: 1947-71 FEA Report, Appendix B; 1975 GAO calculations.

This historical trend can be interpreted to mean that as the market share for refillable bottles falls, the return rate falls. If this interpretation is valid, then an increase in refillable--or deposit--containers could result in an increase in the return rates.

Another interpretation of the declining return rate/declining market share is that as consumers became more affluent and valued convenience more, the refillable, deposit bottle was returned at lower and lower rates which, in turn, made them uneconomical to use. If this is the case, a mandatory deposit on all containers might not cause higher return rates than at present. No matter what the reason for the falling return rate, figures show that the return rate has never decreased to 90 percent. (See table 4.)

The second situation examined was the response of the Oregon beverage market the year after a mandatory deposit was implemented. The return rates rose to well over 90

percent for both soft drinks and beer after the bill. 1/ Individual bottling plants and breweries were reporting 1976 return rates of over 92 percent.

Energy and container cost break-even analysis

The choice of bottle return rate is important because some of the expected benefits of a mandatory deposit system result from refilling returned bottles. The following table presents the costs of refillable beer bottles and three other one-way beer containers. The refillable cost is shown as though the bottle only makes one trip.

Table 5

Beer Containers--Energy and Container Costs

	Container costs at point of filling (1974 dollars) (cents)		Total energy content per 1,000 gallons delivered	
Refillable bottle	7.2	(1.35)	55 million Btus	(13.3)
One-way bottle	4.7	(1.11)	35 " "	(-)
Aluminum can	6.0	(0.35)	a/50 " "	(-)
Steel can	6.2	(0.35)	a/30 " "	(-)
Recycled aluminum can (80%)		N/A	26 " "	(-)

a/100 percent virgin materials.

At first glance table 5 appears to show that a refillable bottle would need to make less than two trips to break even on both per filling cost and total energy use. This is somewhat misleading as the refillable bottle needs more packaging per filling and requires more energy to fill and deliver than a one-way container. The cost and energy numbers in parenthesis in table 5 show the cost for each container's packaging and the energy which must be expended for the refillable bottle's "trip dependent" energy use. When this adjustment is made and the containers are compared, the breakeven point for perfilling container cost is a maximum of 1.7 trips (a 40-percent return rate) and for energy use is a maximum of 2.5 trips (a 60-percent return rate). A similar analysis for soft drink containers results in 2.7 trips for the container cost and 2.5 trips for energy use.

1/Gudger, Charles M., and Bailes, Jack C., "The Economic Impact of Oregon's 'Bottle Bill,'" Oregon State University, Corvallis, Oregon, March 1974.

The use of energy numbers for an aluminum can with 80-percent recycled metal increases the energy break-even point to 3.3 for soft drinks and 3.8 for beer. It is interesting to note that a refillable beer container only needs to make 4.4 trips (77-percent return rate) before the cost of the packaging, such as tops, cartons, labeling, and six-pack carriers, is more on a perfilling basis than the cost of the actual container. 1/ The same calculation for the energy costs of a refillable beer bottle shows that the trip-dependent usage becomes greater than the trip independent-usage when a refillable bottle makes more than 3.2 trips (69-percent return rate). This means that packaging costs and distribution energy use become a larger and larger part of the costs of refillable bottles as return rates increase. The refillable bottle perfilling container costs can never fall below the packaging costs (1.35 cents in this example), nor can the energy use per 1,000 gallons delivered fall below the trip dependent use (13.3 million Btus (British thermal units)).

Can return rates

We assumed for this report that the can return rate would be 80 percent under a mandatory deposit system. This is 10 percent lower than the assumed bottle rate. There is no conceptual difference between a can bearing a deposit and a refillable bottle with a deposit, but the limited experience with deposit cans does not yet support a 90-percent return rate.

The mandatory deposit law in Oregon did not ban cans, and the return rate for cans in that State was rising toward 70 percent the first year after the law--1973--and was reported to be 80 percent in 1976. Another experience with a mandatory deposit system is the ongoing test of mandatory deposits at selected military installations. The Department of Defense is running a 1-year test at 10 military installations before

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1/ 7.22 cents total containers and perfilling packaging cost
-1.35 cents perfilling packaging cost
5.87 cents new refillable beer bottle

The number of trips a bottle must make to have a perfilling cost equal to the perfilling packaging cost is 5.87 cents divided by (x = 1.35 cents) or 4.35 trips.

implementing a military system in compliance with Environmental Protection Agency regulations. 1/ The test was begun at Ft. Knox, Kentucky, and resulted in initial low return rates. The rate rose quickly, and the sixth month, September 1977, was reported to have a 91.4-percent return rate. The other nine test installations began 1 to 3 months after Ft. Knox and exhibited a similar pattern of low return rates the first month. All but one site reported return rates above 70 percent by the third full month. 2/ These results can only be considered preliminary, but using Ft. Knox data, we can calculate a can return rate as follows: assume that all deposit bottles sold (16 percent of total September deposit containers) are returned; cans would have to be returned at a minimum of 89.9 percent. 3/

Container mix

The term container mix describes how many of each type of container the beverage companies use to sell their products. Knowing the market share of each container type is important. As the container mix changes, so too will the environmental and economic effects of the total beverage system. Therefore, we had to assume a container mix for the mandatory deposit system to calculate these effects which are at the heart of the mandatory deposit system debate.

The type of single value assumptions we made for sales levels and return rates under a mandatory deposit system cannot be duplicated for the assumed container mix because the container mix depends largely on market response and on decisions made by the beverage industries-breweries and bottlers. Therefore, if the dominant companies (a few producers dominate the market) decided to produce mostly refillable bottles, other producers would probably follow their lead, resulting in a container mix with more refillables.

1/40 C.F.R. 244.

2/Conversation with Franklin Associates, Prairie Village, Kansas.

3/Overall September deposit container return rate 91.4%. Assumed bottle return rate 100.0%. Deposit sales as share of total (16%). Can sales as share of total (84%).

The can return rate is unknown (y), then .914 = (100.0 x 16%) + (y x 84%); .84y = .754; y = .898).

Or, the dominant producers could continue to use mostly one-way containers. This decision could influence the container mix toward one-way containers.

A container mix under a mandatory deposit system cannot be predicted with any certainty. Therefore, we assumed two container mixes:

--Container Mix I will approximate use of the existing stock of beverage production equipment and is represented by using the baseline canned beverage estimates. All bottles are assumed to become refillable.

--Container Mix II will approximate a return to primarily refillable bottles, with cans holding 20 percent of the sales.

The following table sets out the assumed container mixes and compares them with baseline container mix.

Table 6

	1977 Prior to deposit	1981 Baseline no deposit	1981 Mandatory deposit Mix I	1981 Mandatory deposit Mix II
	(percent)			
Total	100	100	100	100
Refillable	27	24	48	80
One-way bottles	24	24	-	-
Cans	48	52	52	20

Neither container mix is "most likely" nor should the mathematical mid-point between the two be used as the "most likely" result of a mandatory deposit. The two container mixes used in this report are representative of the two extremes which might result under a deposit, but industry response to a mandatory deposit could result in any mix, even a mix not within the boundaries in table 6.

In summary, the effects of a mandatory deposit system used in this report are based on three important assumptions:

--The return rate will be at least 90 percent for refillable bottles and at least 80 percent for cans.

--Total beverage sales will not be affected by mandatory deposits.

--The container mix under a mandatory deposit is not predictable. A range of possibilities is represented by Mix I which continues the baseline proportion of cans, and by a Mix II, in which 80 percent of the market will be refillable bottles.

Other assumptions

In addition to the three basic elements of the beverage market, we made assumptions about the mechanics of instituting a mandatory deposit system. Time is needed between enactment of the legislation and implementation of the deposit law to establish a system for collection of containers and to educate the public and industry on the mechanics of the system. We chose a January 1, 1977, date for enactment, with implementation to begin 1 year later on January 1, 1978, at which time a 5-cent deposit would be required on all beverage containers.

Transition period

Of more importance was the selection of a reasonable transition period after the implementation date. If industries chose to market their products in mostly refillable bottles, neither the changeover of equipment nor the build-up of bottle inventories could be accomplished within a short period. There would probably be leadtimes of several years for some filling equipment, and other bottlenecks could occur. Recognizing this, we have assumed that the new equilibrium in the beverage system, whether it resembles Mix I or Mix II, will be established 3 years after the date of implementation. For example, Mix II assumes that 80 percent of all beverage fillings will be in refillable bottles. With a 3-year transition period, that mix would be achieved gradually rather than overnight.

The assumption of a 3-year transition period has no certainty associated with it. The beverage system industries could take non-capital intensive measures, such as multiple shifts and/or use of underutilized equipment, to arrive at their desired mix more rapidly, or a mix with predominately refillable bottles could take longer to achieve. The role of the 3-year phase-in is to represent that adjustment to a mandatory deposit law will probably not be immediate.

Role of the one-way bottle

By definition, the one-way bottle will not exist under a mandatory deposit system because all containers would be

returnable. Since the consumer will not perceive any difference between a one-way bottle and a bottle designed for refilling when both bear a deposit, the beverage industry would probably not continue to use bottles designed for one trip in any quantities. The cost advantage in refilling a bottle rather than throwing it away or selling it for recycling is substantial. The imported beers would probably continue to use nonrefillable bottles and in some cases bottles returned to the beverage company would not be refilled. We have assumed at the end of the adjustment period that all glass containers in the beverage system will be designed for refilling, eliminating the one-way glass container in fact as well as by definition.

Aluminum and steel can shares

We have assumed for Mix I that the can share of the beverage container market will be the same as the baseline estimate. Consistent with this assumption for Mix I, we assumed that the aluminum and steel container shares would stay the same as the FEA estimates. Container Mix II assumes that the can share will be reduced to 20 percent by 1981. This is a large reduction which makes estimating how container producers would react difficult. We have assumed that the container with the highest scrap value--aluminum--would dominate the reduced can market of Mix II. The 20-percent market share is allocated between steel--5 percent--and aluminum--15 percent--based on relative scrap value.

Plastic containers

Plastic bottles are presently being marketed by several soft drink companies in the United States. We did not, however, include any plastic containers in the beverage container mix projected for the baseline or for the beverage system under a mandatory deposit system. This is because of the difficulty of predicting when, if ever, plastic bottles would become a measurable share of the beverage container mix. One compounding problem is that the Food and Drug Administration recently banned--effective December 22, 1977--one type of plastic bottle which had been on the market. 1/ The banned acrylonitrile-based plastic is being replaced by a polyester-based plastic. In any case, significant container market penetration by plastic bottles would not change too much of the analysis which follows, as the energy profile of plastic bottles is similar to existing one-way containers, and costs would probably not be much different from competing one-way containers.

1/See our report entitled, "Food Additive Acrylonitrile, Banned In Beverage Containers," (HRD-78-9, Nov. 2, 1977).

CHAPTER 3

ENVIRONMENTAL EFFECTS OF A MANDATORY DEPOSIT LAW

Litter was the initial environmental problem associated with the one-way beverage container. Eventually the term environmental, as it relates to beverage containers, broadened until it now encompasses the areas of raw materials and solid waste, as well as litter. In this chapter we will discuss each of these areas, as well as energy use. The quantity of each type of container used by the beer and soft drink companies determines to what extent each of the various environmental areas are affected by the industries in the beverage system.

EFFECTS ON RAW MATERIALS

Beverage containers are made from glass, steel, and aluminum and their respective raw materials are primarily sand, iron ore, and bauxite. Changes in the raw material requirements of a mandatory deposit system would occur both because there would probably be fewer new containers made, and because the metal cans sold would be returned to a central location with recycling possibilities. Any reduction in glass sand use is not important, as it is so plentiful. Reductions in iron ore and bauxite use are discussed below.

Iron ore

Iron ore comprises about 55 percent of the material used to make bimetal steel containers and 75 percent to make virgin all-steel cans. Under container Mix II of the mandatory deposit system (see p. 17) steel can production in 1985 is assumed to drop to 6.6 billion cans from the 39.2 billion predicted under the baseline. This could reduce iron ore requirements for the United States in 1985 by 3 million tons, or about 2 percent of total iron ore consumption. Container Mix I assumes no decrease in steel can production under a mandatory deposit, but about 80 percent of the cans would be returned for redemption. If these cans were recycled, the iron ore requirements would be reduced by about 2 million tons in 1985.

A reduction in iron ore consumption is important because one-third of U.S. iron ore is now imported, and domestic ore is coming from increasingly lower grade deposits. A decline in the number of steel cans produced and/or an increase in recycling rates would help to extend iron ore reserves.

Bauxite

The aluminum beverage containers produced in 1975 used about 7 percent of the total U.S. bauxite requirements, or 1.2 million tons. About 25 percent of the 16.6 billion cans produced were estimated to have been recycled.

The 1985 baseline figures show about 34.9 billion cans, while the two container mixes assumed for a mandatory deposit show the same number for Mix I, 34.9 billion, but only 19.7 billion for Mix II. If one assumes that all the cans returned are recycled, the following are the bauxite requirements for beverage cans.

Table 7

1985 Bauxite Requirements

	Baseline	Mix I	Mix II
Cans produced (billions)	34.9	34.9	19.7
Return rate (note a)	45 percent	80 percent	80 percent
Bauxite (millions)	1.9 tons	0.9 tons	0.5 tons

a/The baseline return rate includes both voluntary recycling and recycling from resource recovery, or retrieving commercially valuable items from municipal garbage. The mandatory deposit rate does not include recycling from resource recovery.

From this table, reductions of 1.0 million tons of bauxite under Mix I and about 1.4 million tons under Mix II are possible by 1985 when compared to the baseline. If other aluminum use continues to grow, such reductions would represent from 2.4 to 3.5 percent of total bauxite demand.

Our comments about extending mineral reserves in the previous section are relevant here, especially since only 10 percent of the bauxite needed at present comes from domestic sources.

The reductions in raw material use may seem to be insignificant as sand, iron ore, and bauxite are in plentiful worldwide supply. Two facts should be considered before these reductions are dismissed as meaningless. First, virgin materials have been preferred to recycled materials for many reasons, including depletion allowances and vertical integration

of materials processing firms. 1/ A mandatory deposit on beverage containers is one means of equalizing the competition between the two. Second, the U.S. bauxite and iron ore supply depends heavily on imports. If the potential reductions in raw materials were made mostly from imports there would be important balance of payments trade account benefits.

Water

The increased use of water for washing returned bottles is asserted to be a negative effect if refillable containers become more widely used under a mandatory deposit system. Refillable containers require more process water in the filling phase; approximately 100,000 gallons more than one-way bottles and cans for each million containers. However, when all the steps from mining through filling to disposal are compared for water use, the 10-trip refillable bottle and the aluminum can are the lowest water users.

Water use per 1,000 gallons of beer delivered

	Refillable bottle (10 trips)	One-way bottle	Bimetal steel	Aluminum
Water discharged (1,000 gallons)	15.4	36.9	34.1	15.1

Source: Environmental Protection Agency, "Resource and Environmental Profile Analysis of Nine Beverage Container Alternatives," p. 21, Washington, D.C., 1974.

LITTER

The increasing presence of beverage cans and bottles in litter has been the primary reason for efforts to control one-way containers. As mentioned in chapter 1, more reasons are now used as support for a mandatory deposit system, but litter reduction still remains important.

Three types of costs are associated with litter, none of which are easily quantifiable. One is aesthetic blight. Although there is little disagreement with the fact that

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1/"Government and the Nations Resources: Report of the National Commission on Supplies and Shortages," December 1976 p. 161.

more litter is uglier than less litter, little work has been done to translate this fact into dollars and cents. A second type of cost is medical. Approximately 80 percent of an estimated 300,000 litter-caused injuries in California alone were caused by broken glass and pull tabs in 1974, 1/ but since people often do not go to the doctor for these injuries, compiling medical bills would be an inaccurate assessment of the total medical cost. The third type of cost is litter cleanup. Using the existing cost of litter pickup in the United States would underestimate the true cost. Most people would prefer less litter than we now have and, therefore, even more money could be spent on this problem.

In addition to the difficulty in placing a total cost on litter, there is little agreement on how to measure litter. Even if there were agreement on measurement techniques, the question remains as to what litter to count: permanent litter or accumulated litter and also what size items should be included. All studies on this subject, no matter what measurement devices used, show that the beverage container and its related items are a significant part of litter in America. 2/

1/Syrek, Daniel B., "California Litter: A Comprehensive Analsis and Plan for Abatement," Institute for Applied Reserarch (for the California State Legislature), Carmichael, CA, May 1975.

2/

		Permanent cover*	Accumulation*
		(percent)	
1969	Keep America Beautiful (piece count)	31.6	19.7
1972	Oregon Pre-Law (piece count)	-	30.0
1973	Vermont Pre-Law (volume)	-	36.0
1971	Florida (piece count)	36.3	15.4
1975	Kentucky (piece count)	51.5	46.0
1975	California (piece count)	-	22

*Accumulation rate counts the litter which has "accumulated" over a period of time after an area is cleaned. A permanent cover measurement would count the litter which was removed from an area which had not been cleaned for a long period.

Source: All except California--"The Impact of Litter" (Kentucky Research Report, No. 127) October 1975, Frankfort, Kentucky.

California--Syrek, Daniel B., Op. Cit

A study of California litter 1/ is the first attempt to measure all litter, no matter how small, in all places based on a statistical survey of the State. The survey covered street and highway locations, as well as recreational areas. Several of its findings are important enough to be presented.

Commercial and urban areas had two to five times the litter accumulation count per mile as the open or residential areas, with the beverage container share of total litter decreasing as urbanization increased. On a State-wide basis, beverage container and related items, such as pull tabs and six-pack carriers, were 22 percent of total litter, but beverage cans and bottles alone were only 9 percent by item count. Average daily traffic did not seem to determine litter rates, but adjacent land areas did. Trends in litter tended to parallel monthly soft drink and beer trend sales in California. Public agencies spend $22.7 million a year on litter pickup, with each piece of litter costing between 2 and 11 cents to handle.

There are several ways to estimate the effect of a national mandatory deposit on beverage container litter and on overall litter. One is a mathematical approach where the number of containers not returned for deposit refund under the baseline and under Mixes I and II in 1985 are directly compared. Any reduction could be said to be the probable change in beverage container litter. To illustrate the mathematical approach, littered containers are assumed to be 5 percent of total nonreturned containers.

1/Syrek, Daniel B., Op. Cit.

Table 8

Beverage Container Litter
1985

	Baseline	Mandatory deposit Mix I	Mandatory deposit Mix II
	(billions)	(percent)	
Total containers not returned (one-ways and returnables)	108	20.6	15.8
Littered containers	5.4	1.0	0.8
Percent reduction from the baseline	-	-81	-85

Table 8 indicates that beverage container litter would be reduced by 81 to 85 percent under a mandatory deposit system. For this reduction to occur, the number of littered containers must remain the same proportion of total containers not returned. Many researchers in this area believe there is a hard core of inveterate litterers and, if they do exist, absolute amounts of beverage container litter would not be reduced by such amounts.

A second way to estimate beverage container litter reduction is an examination of the results from the two States with experience with mandatory deposit systems. Vermont surveyed its litter accumulation for 3 months before and after the implementation of its law and found a 76-percent reduction in beverage container litter. Oregon's litter was surveyed for 1 year before the law and 2 years after it, also on an accumulation basis. These litter figures have been the subject of disagreement, but the State of Oregon uses a 72-percent reduction for the first year and a 83-percent reduction for the second year.

We believe that the field data from Vermont and Oregon support the validity of calculating reductions in beverage container litter by the direct mathematical method. This means that a mandatory deposit system could reduce beverage container litter by around 80 percent.

The impact on total litter of a mandatory deposit system depends on the size of the can and bottle litter share. As was indicated on pages 23 and 24, estimates range from 9 to 46 percent on an accumulation basis. This means an overall reduction can be calculated mathematically; if the range of

beverage container litter is 9 to 46 percent as noted above, the total litter reduction would be 7 to 37 percent. 1/

The wide range of estimated reductions in total litter reflect the variety of littered conditions and survey methodologies. If beverage containers are a large share of litter on the ground in any specific area, a mandatory deposit system would reduce the litter to a large extent.

The results from Oregon show that total litter decreased 11 to 26 precent in the first year, with one researcher estimating a second year reduction of 39 percent from the litter count made the year before the container law.

In summary, we believe that beverage container litter would be reduced about 80 percent if a mandatory deposit were to be implemented. By definition, total litter would also be reduced from what it would have been in the absence of a mandatory deposit law. The actual reduction in total litter simply depends upon the amount of can and bottle litter prior to implementation of the system. If the beverage container share was low, the reduction could be as low as 7 percent, or as high as 37 percent if the beverage container share were high.

Direct financial benefits should not be attributed to such a reduction in overall litter. Existing litter cleanup efforts are inadequate, so that a reduction in the amount littered would not mean that existing efforts would or should slacken. Continuing the existing cleanup efforts could, however, make all areas cleaner, thereby reducing the social costs of aesthetic blight.

SOLID WASTE

As noted previously in the section on litter, the baseline figures in 1985 for containers thrown away is 108 billion. These pieces of refuse would weigh about 10.5 million tons, not including their related packaging. Discarded containers would make up about 5 percent by weight of post-consumer garbage by that time. The mandatory deposit system, as assumed for this report, would reduce those figures by reducing the number of containers that would be thrown

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1/.09 beverage container litter as share of total x .8 reduction = .07 or 7 percent reduction.

.46 beverage container litter as share of total x .8 reduction = .37 or 37 percent reduction.

away. As with the litter reductions, the mandatory deposit system has this effect because all containers could be returned, not just a minor share of the total beverage containers. The following table shows estimates of reductions by weight under the mandatory deposit container Mixes I and II.

Table 9

Beverage Containers in Solid Waste--1985 (note a)

	Baseline	Mandatory deposit system Mix I	Mix II
Containers thrown away (billions)	108.0	20.6	15.8
Weight (millions)	10.5 tons	2.3 tons	3.2 tons
Percent total gross postconsumer garbage discarded	5.2 percent	1.1 percent	1.6 percent

a/Our calculations of beverage containers and Environmental Protection Agency (EPA) estimates of solid waste.

There may seem to be an inconsistency between the number of containers and their weights under Mixes I and II. The anomoly can be explained by noting that cans, which are a large share of Mix I, weigh less and have an assumed return rate lower than bottles. Consequently, there would be more containers in the postconsumer waste with Mix I but the increased numbers are mostly the lighter weight cans.

The 3.6 to 4.1 percent potential reduction in the total postconsumer garbage stream is important. Immediate collection costs might not be reduced, but future costs would almost certainly be lower than if the number of one-way beverage containers remained high, as is forecast for the present system. Landfill and dump sites, the final respository for much postconsumer waste, are becoming more scarce as environmental regulations and community pressure limit acceptable areas for them. Any action which can reduce the demands placed on landfill sites is important, especially in the urban Northeast where land costs are higher.

EFFECTS ON ENERGY USE

Energy consumption and conservation have become critical national issues in the last few years. The total energy requirement of the baseline beverage system in 1985 is about 360 trillion British thermal units (Btus). This would be about 4/10 of 1 percent of the estimated U.S. demand of 91,000 trillion Btus in 1985. 1/ A mandatory deposit system which resulted in a container mix similar to Mix I--no change in the baseline can share--would decrease beverage system energy use about 32 percent. A mix with mostly refillable bottles--assumed to be 80 precent in Mix II--would decrease energy use about 43 percent. The Mix II reduction would be a 2/10 of 1 percent reduction of total U.S. energy use in 1985.

The following table compares the baseline beverage system in 1985 with the two mixes assumed under a mandatory deposit system.

Table 10

Energy Requirements for Total Beverage System
(131.5 billion 12 oz. equivalent fillings)

	Baseline	Mix I	Mix II
Total energy use (trillion Btus)	363	247	208
Refillable bottles	41	72	144
One-way bottles	96	0	0
Aluminum cans	120	86	49
Steel cans	106	89	15

1/Federal Energy Administration, "1977 National Energy Outlook" (draft) January 15, 1977, Washington, D.C., p. 3.

The energy savings which would be realized from a mandatory deposit system can come about because of more can recycling and using only refillable bottles for glass fillings--Mix I--or through much greater use of the refillable bottles--Mix II. As can be seen from the above table, the greater the use of refillable bottles, the greater the energy savings.

Direct comparisons of container types

The energy requirements for the total beverage system shown in table 10 are based on the energy required 1/ to deliver 1,000 gallons of the beverage to the consumer. The refillable bottle which makes 10 trips 2/ has the lowest energy use per 1,000 gallons of any beverage container in use today. The following table shows the energy profiles for the beverage containers as they are projected to be in 1985. These numbers have incorporated projected gains in efficiency and design.

1/This includes raw materials mining, materials processing (both virgin and recycled), container fabrication, filling and distribution, use and final disposal, and transportation between each phase. Energy requirements were calculated for container, closure, label, and associated secondary packaging.

2/A return rate of 90 percent translates to an average of 10 trips.

Table 11

Energy Profiles
(millions of Btus for each 1,000 gallons)

	No Refilling/ No Recycling	90% Refilled/ 80% Recycled (note a)
Glass (note b)		
Beer	34.7	17.5
Soft Drink	37.1	12.1
Metal (note c)		
Aluminum	50.6	26.5
Steel	29.8	24.2

a/Glass = 10 trips, metal = 80 percent available for recycle.

b/All containers are 12 oz. except for soft drink glass which is 16 oz.

c/Same for soft drink and beer.

The savings in the refillable bottle use when compared to one-way bottles come from the multiple use of each bottle, while the recycling of aluminum greatly reduces the energy required to produce the molten metal. Steel can recycling affords some savings from a system viewpoint. Even with the large reduction in energy use when using recycled aluminum cans with 80 percent available for remelting, refillable glass bottles are clearly the most energy efficient beverage container.

CHAPTER 4

HOW INDUSTRIES WOULD BE AFFECTED

The post-World War II situation in the beverage system has been one of change. The industries which actually fill containers--breweries and bottlers--have undergone consolidation and centralization. Breweries have declined in number from around 300 in the 1950s to 100 today, and soft drink bottling plants have gone from 4,500 in 1960 to 2,300. The beverage can has been the growth market for the metal can industry, as the one-way beverage bottle has been for the glass bottle industry. The retail food sales business, where most retail beverage sales occur, has been transformed to an industry dominated by large firms with many stores.

All these industry groups believe that they will be affected by national mandatory deposit legislation and are concerned about the possible changes in their way and cost of doing business. For instance, if a mandatory deposit resulted in a return to mostly refillable bottles, can industries and their major suppliers would be producing fewer containers for the beverage market; brewers and bottlers would be using more refillable bottles, which would require different filling lines; wholesale and retail outlets would be selling more of their beverages in refillable bottles and redeeming many more containers.

A mandatory deposit would not, however, require any change in the present container mix if the legislation implementing a mandatory deposit applied an equal deposit on all containers and did not ban any container. The mandatory deposit system assumed in this report is based on these two requirements; however, the two assumed container mixes recognize the fact that industry reaction to a mandatory deposit is not predictable and may result in a container mix which is similar to or much different than the present system. The unpredictability is greater than in many industries because each phase of the beverage and container system is dominated by two or three firms. The reaction of all of the industries in the beverage system will very much depend on the reaction of these dominant firms.

This chapter examines possible changes that would occur in the component parts of the present beverage system if a mandatory deposit system similar to that postulated in this report went into effect. Each section of the beverage system--beverage companies, container companies, indirect

industries, retail outlets--would be affected differently.1/ The changes fall into five categories: employment, capital, containers, retained deposits, and beer transport.

These changes will be looked at from the perspective of their effect on the total beverage system and their effect on individual industries.

INDUSTRIES' ECONOMIC CHANGES

The size of these changes will be largely determined by the amount of change which the affected industries decide to make in their container mix as a result of a national mandatory deposit law. If the container mix were only altered to the extent that all bottles became refillable bottles--our Mix I assumption--2/ the business costs would be relatively small. There would be the increased storage space for returned containers and increased empty container transport. Filling lines would need to be converted to handle refillable bottles. Container cost decreases and increases in retained deposits would be offsets to the cost increases in the breweries and bottling plants. If the container mix became predominately refillable containers--our assumed Mix II--, then the cost increases would be greater, but the cost decreases would also be greater.

Changeover period, 1978-1980

We have assumed that the adjustment to a mandatory deposit law after implementation would take 3 years for both

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1/We made no attempt to calculate any economic changes in the energy industries which could be attributed to the potential decrease in energy requirements. Decreases of 2/10 of 1 percent of total 1985 demand (see p. 28) might lead to some large future reductions in the energy producing capacity required for the United States, but the capital impacts of energy conservation were not addressed.

2/

Container Mix	1977 Baseline	1981 Baseline	1981 Mandatory Deposits Mix I	1981 Mandatory Deposits Mix II
	(percent)			
Refillable bottles	27	24	48	80
One-way bottles	24	24	0	0
Cans	48	52	52	20

Mixes I and II, and after the adjustment period that incremental change would again be the rule. The changes which the beverage system must make to go from a voluntary, partial-coverage deposit system to a national full-coverage deposit system can be grouped into five areas: capital, labor, beer transport, containers, and retained deposits. A summary of the changeover period costs are presented in table 12.

Table 12

Changeover 1978-1980 Beverage System
(brewers, bottlers, distributors, and retailers)
(1974 dollars--millions)

	Baseline	Mix I	Mix II
Capital stock	$ 668	$ 1,486	$ 3,116
Worker years, wages	8,753	9,746	10,540
New containers, purchase cost	14,460	13,332	10,770
Retained deposits (note a)	-536	-2,602	-2,299
Beer transportation	1,081	1,118	1,327
Total	$24,426	$23,080	$23,454
Net difference		-1,346	-992

a/Retained deposits are subtracted from the totals because they can be considered income or a decrease in costs.

Many studies have estimated very high net changeover costs for a mandatory deposit system. Our results are different because all major elements are compared. Most other analyses, for example, would include a new container changeover cost only for the increase in refillable bottle purchases--about $1.6 billion for Mix II over the baseline. We analyzed total new container purchases required, which reveals about a $3.7 billion reduction in Mix II new container purchases during the 1978-80 changeover period. The large increases in retained deposits is another important offset to changeover costs which is not usually mentioned.

These changeover costs will be further explained in the part of the chapter which deals with individual industry groups. Appendix III also provides tables with details of this analysis.

Annual changes after the 1978-80 changeover period

This section describes the ongoing effects of a mandatory deposit system. Once the changeover to an equilibrium container mix is accomplished, the annual or ongoing costs will be the costs to operate and improve the system. These costs were calculated for both the baseline and the two mandatory deposit container mixes. The comparison year was 1981, the first year after the 3-year adjustment period. The costs in this table only represent changes in cost elements which would be affected by the mandatory deposit law.

Table 13

Beverage and Retail Industries	Mix I	Mix II
	(1974 dollars--millions)	
Capital investment	$ 8	$ 66
Wages	493	1,164
Container costs, per filling	-1,061	-2,688
Retained deposits (note a)	-785	-588
Beer transport	25	63
Total net change	-$1,319	-$1,983

a/Deposits retained treated as a reduction in costs.

In addition to the above two industry groups, we calculated ongoing effects for container industries and other, more indirect supplier industries. For the container industries and their direct suppliers, a switch in the container mix to more refillable bottles and the same share for cans (Mix I), or even to more refillable bottles (Mix II) under a national mandatory deposit system would result in them losing the market for their products which they gained during the 10 to 20 year switch to one-way beverage containers. Even though this would reduce employment and negate the need for expansion capital, these reductions are essentially represented by the net container cost reduction presented in table 13. The size of the capital and employment reductions are, however, described in the following sections.

As will be seen in the following sections, and in appendix III, each industry group will be affected differently. The major offsets to increased wages and capital costs--cheaper container costs and increased retained deposits--are concentrated in the brewing and soft drink industries. If the beverage industries do not choose to pass their savings forward to retailers/wholesalers, the consumer would not

experience any price reduction. A recent study done for the U.S. Brewer's Association (USBA) shows that a 100-percent refillable bottle system would lower a brewery's per case cost for beer by 48 cents, but the per case cost to the wholesaler would only be lowered 22 cents. 1/ If such a reaction by an industry group to lower costs actually occurred, and all of the cost increases were passed forward to the consumer, the existing practice today of lower prices for refillable, deposit bottles might not continue under a mandatory deposit system.

The potential cost decreases under a mandatory deposit system are large. They could result in beverage price reductions to the consumer if price competition causes bottlers and brewers to pass cost savings forward to the retailer/wholesaler.

BEVERAGE INDUSTRY CHANGES

Under a mandatory deposit system, the beverage companies, which include brewers, beer wholesalers, and soft drink bottlers and distributors plus retailers, would require more space and personnel to handle increased numbers of returned containers. If the container mix also changes, the beverage companies would require even more equipment, space, and workers, but fewer containers. These changes are presented below for 1978 to 1980, as an indication of the costs of the changeover period, and for 1981 as an indication of the costs of the ongoing changes.

1/"A Study of the Impacts on the USA of a Ban on One-Way Beverage Containers," prepared for the U.S. Brewer's Association by Busch Center, The Wharton School, University of Pennsylvania, December 1976, p. 46, Volume I.

Table 14

Changeover Costs 1978-80
Beverage Industries and Retailers
(1974 dollars--millions)

	Baseline	Mix I	Mix II
Breweries:	$9,492.2	$7,991.3	$7,345.6
Capital stock	136.3	252.2	955.5
Wages	1,039.4	1,049.8	1,183.2
New containers	7,304.4	6,868.1	4,965.5
Retained deposits (note a)	- 68.5	-1,296.9	-1,085.7
Beer transportation (note b)	1,080.6	1,118.1	1,327.1
Beer distributors:	$3,721.4	$4,068.7	$4,779.3
Capital stock	125.5	232.6	556.2
Wages	3,595.9	3,836.1	4,221.1
Soft drink bottlers and distributors:	$11,091.3	$10,102.4	$10,328.1
Capital stock	403.9	761.1	1,330.5
Wages	3,999.4	4,182.5	4,406.7
New containers	7,155.6	6,464.3	5,804.6
Retained deposits (note a)	-467.6	-1,305.5	-1,213.7
Retailers:	$ 120.2	$ 917.1	$1,000.6
Capital stock	2.4	240.0	272.0
Wages	117.8	677.1	728.6
Total	$24,425.1	$23,079.5	$23,453.6

a/These calculations assume the deposit is first applied at the bottler and brewery level. Deposits retained on containers not returned accrue to whomever first placed the deposit on the container.

b/The brewery to distributor transportation is not in other estimates. Soft drink transportation is not shown seperately, as soft drink distribution capital and employment estimates includes the increased transportation requirements for a mandatory deposit.

Per case costs during changeover period

The above cost changes can be put on a per unit basis to give a different perspective. Using a case of 24, 12-ounce containers as the unit, the changes in the cost of an average case can be traced from brewery/bottler to retailer.

For breweries during the 1978-80 changeover, a container mix similar to Mix I would reduce costs from $9.5 billion to $8.0 billion. (See table 14.) This decrease of $1.5 billion would be spread over 6,440 million cases of beer produced during that 3-year period. There would be a decrease of 23 cents in the average case cost of beer as delivered to the distributor. Each segment of the beer system, however, would not experience a decrease in costs. The next step, the distributors, would result in an increase of $347 million under Mix I, or an increase of 5 cents per average case to handle and move beer to the retailer. The third step in the system, the retailer, would incur a $905 million increase in costs for both beer and soft drinks which translates to 5 cents for an average case under Mix I. These same calculations done for Mix II show a decrease of 33 cents at the brewery and increases of 16 cents and 6 cents at the distributor and retailer, respectively.

The per case calculations for the soft drink industry are done based on 7,974 million cases produced during 1978-80. Because the soft drink bottler is also usually the distributor, those cost changes only have to be shown for two segments. Mix I would result in a $1 billion cost reduction at the bottler-distributor or 13 cents a case. As noted above, the cost to handle an average case at the retail level would go up about 5 cents a case under Mix I. The Mix II soft drink analysis shows cost changes of 10 cents at the bottler-distributor and plus 6 cents at the retailer.

These per case estimates only treat changes in the production and handling/distribution costs. Because production costs do not equal the price the consumer pays for a product, the per case cost changes for beer or soft drinks cannot be added to estimate an increase or decrease in the consumer's price unless cost decreases were to be passed along as well as cost increases. In such a case beer prices to the consumer might fall by 11 to 13 cents and soft drink prices by 4 to 8 cents an average case.

Even if only part of the potential cost decreases are passed along by the brewers and the bottlers, the changeover period should not cause as much economic dislocation as some

have claimed. In fact, potential certainly exists for consumer price reductions if industry decides on a container mix where refillable bottles replace some of the one-way containers.

Ongoing costs

After the changeover has been accomplished by the beverage industries, there would be ongoing differences as compared to the baseline in capital, labor, and container costs. Table 15 details these changes:

Table 15

1981 Ongoing Costs
Beverage Industries and Retailers
(1974 dollars--millions)

	Baseline	Mix I	Mix II
Breweries:	$3,732.4	$2,968.0	$2,184.9
Capital	23.8	22.0	38.1
Wages	321.9	331.0	417.8
Container costs	3,028.8	2,680.7	1,518.3
Retained deposits	- 18.9	-468.4	- 329.5
Beer transport	376.8	402.7	540.2
Beer distributors:	$1,198.6	$1,360.0	$1,794.1
Capital	18.7	20.1	36.9
Wages	1,179.9	1,339.9	1,757.2
Soft drink bottlers and distributors:	$4,569.4	$3,643.0	$3,410.7
Capital	38.8	40.5	61.7
Wages	1,381.3	1,501.6	1,653.1
Container costs	3,277.0	2,564.0	2,099.8
Retained deposits	- 127.7	- 463.1	- 403.9
Retailers:	$ 59.2	$ 270.0	$ 287.2
Capital	- 1.8	5.0	9.2
Wages	61.0	265.0	280.0
Total	$9,559.6	$8,241.0	$7,678.9
Ongoing net differences		-$1,318.6	-$1,880.7

This ongoing cost list indicates that Mix I and Mix II would be the lowest cost system on an ongoing basis. The container cost savings outweigh the increases in capital and labor.

The employment changes for the 1981, or ongoing, comparisons are increases in each industry group for the mandatory deposit system. The Mix I total employment increase over the baseline is 51,000--almost all distribution and retail workers. The Mix II increase totals 102,600 and is made up on a 7,400 increase for the breweries, 37,500 for beer distributors, 28,000 for soft drink bottlers/distributors, and 29,700 for retail stores.

Ongoing per case cost changes

The per case cost is calculated as it was for the changeover period. The $764 million cost reduction (of Mix I) at the breweries would be spread over 2,288 million cases, so the cost of an average case could go down 33 cents; distribution costs affected by the mandatory deposit would go up 7 cents and retail costs up 4 cents. Similar Mix I calculations for 2,805 million cases of soft drink result in a 33-cent reduction at the bottler-distributor level, and retail costs per average case rise 4 cents.

The Mix II per case calculations are, for beer, a 68-cent reduction, brewery; a 26-cent increase, distributor level; and a 5-cent retail level increase. For soft drinks, the average cost per case would decrease 41 cents at the bottler and the retail cost woud go up 5 cents.

These per average case cost calculations are used to illustrate the cost changes which might occur under a mandatory deposit system, both during a changeover period and annually. The changes would be large, but the increases in wages, beer transport, and capital are more than offset by the large reductions in container costs and retained deposits.

CONTAINER INDUSTRY--1981 CHANGES ONLY

The container companies and those industries which supply them with container materials--primarily steel and aluminum--would experience changed employment and capital investment requirements as a result of the assumed mandatory deposit system. We did not analyze the container industry during the 1978-80 changeover period as was done for the beverage industry. The number of containers purchased, however, gives an indication of the impact of mandatory deposits during the changeover. Under container Mix I, can sales would be the same during the 1978-80 period as under the baseline, but 32 billion fewer new glass containers would be needed because the one-way glass bottle is assumed to be replaced by the refillable bottle. Under container

Mix II, both can and bottle production is assumed to decline--by 61 billion cans and by 20 billion bottles.

Both of the assumed mixes would result in estimated employment losses. Mix I would reduce employment in the container and metal supplier industries by about 30,700 in 1981 below the FEA study baseline, while Mix II would reduce employment by about 61,400.

An economic forecasting model 1/ was used to estimate the ongoing capital investment changes for the container companies and their primary metal suppliers under container Mix II. According to the model, capital investment in 1981 for these companies would be about $180 million less than the baseline estimates. We estimated the bottle producers' capital investment and equipment changes for Mix I at about a $60 million reduction.

INDIRECT INDUSTRIES--1981 CHANGES ONLY

The indirect industries, such as paperboard containers, transportation, and vehicles, do only part of their business with container and beverage industries. The same economic forecasting model was used to estimate ongoing employment and capital investment changes in these industries as was used for the container industries. This showed that in 1981, net employment would be reduced by about 9,000 and capital investment would be reduced by about $19 million under container Mix II. Container Mix I was not used to calculate any impacts on indirect industries, but the impact would be even smaller than that of Mix II shown above.

CONCLUSION

The economic costs of a mandatory deposit on beverage containers are concentrated in the industries which fill the beverage into the container, which move the filled container to the point of consumer purchase and which sell the beverage to the consumer. A refillable container is cheaper on a per-use basis than a one-way glass or metal container, but costs more to fill with beverage and to move to point of sale. Our analysis of the cost factors reveals that during the changeover period--1978-80--the net costs to the beverage system for the beverage filling, transporting, and sales industries would go down $1 billion to $1.3 billion.

1/Chase Econometrics interindustry long-term forecasting model.

The ongoing cost differences after the 3-year adjustment period for the system noted above shows a potential annual cost reduction of $1.3 billion to $1.9 billion. The cost decreases, however, are concentrated in the beverage filling industries, while the cost increases fall on the transportation/distribution and retail sales industries. If the brewers and bottlers choose not to pass all of their cost savings forward, then the decrease in systemwide costs might not be evident at the point of retail sales.

CHAPTER 5

ROLE OF THE CONSUMER

The firms which make beverages ultimately depend on two different customers for their success: (1) the intermediate purchaser of packaged beverages--usually the retail food stores, and (2) the final purchaser--or consumer of the beverage.

The intermediate customers have had a definite influence on beverage firms. In fact, much of the impetus to change from refillable to one-way containers came from these customers. The retail food stores determine what types of beverages to purchase based on what will sell, what effect the product will have on profits, and what they estimate will be most convenient for them to handle. As the one-way container became available, store management saw that this type of container was more convenient for them, gave them a higher priced good to mark up and required no handling of returns. Thus, the stores pushed for more beverages in one-way containers as they sought to maximize their own convenience and profits, and cut their labor costs.

Retail stores would lose some of the incentive to deal mainly in nonrefillable containers under a mandatory deposit law, as previously one-way containers would become deposit containers which would require handling as empties. This, in turn, might reduce the retail store's pressure on the beverage companies to package their product mostly in nonrefillable containers.

The final customer, the consumer, may actually have had little effect on the beverage and container industries' choice of container type. The customer is primarily buying a beverage, perhaps a particular brand, and is only secondarily interested in the container. Proponents of a mandatory deposit believe industry has used this fact to its benefit, supplying the consumer with beverages only in containers that are easier for industry to handle but more expensive to the purchaser. They note that in many stores the consumer actually has no choice between refillable and nonrefillable container types but only a choice between types of nonreturnables.

Opponents of the legislation view the situation differently. In their opinion, the consumer is buying a beverage plus the convenience of not returning the container. They argue that the pressure to package beverages in one-way

containers came from the consumer who liked the convenience associated with throwaway containers. The refillable bottle has such a small share of the beverage market because it could not compete with the one-way container and its convenience to the final consumer.

Whether or not the consumer is actually indifferent to a wide variety of beverage containers is debatable, and so the final consumer's part in the present one-way beverage market is uncertain. Past experience seems to indicate, though, that business considerations other than the factor of consumer pressure cause beverage companies to change their packaging. Market tests are done to insure that a new package type will not be rejected, but once that fact is established, business decisions are based mainly on two factors--cost to the beverage companies and ease of handling for the distributor and the retail seller. Although it is not possible to eliminate completely the role of consumers demanding convenience in the switch from refillable to one-way containers, more likely the change was a result of these latter two factors.

Now that one-way containers do dominate the beer and soft drink market, the consumer has become accustomed to the convenience of disposing of the beverage containers. Opponents claim this convenience will be lost under a mandatory deposit system. Actually, a mandatory deposit will not eliminate throwaway convenience, but will charge even more for it. A consumer would be able to purchase beverages in any type of container and throw the container away if he or she pleases. The consumer who chooses to act in that fashion would lose the deposit, not convenience; convenience would begin to have a definite, attributable cost.

For those who choose not to pay for the convenience of disposal of the beverage containers, the mandatory deposit system will add a new inconvenience--the need to return the containers for the deposit refund. This inconvenience would be minimized under a mandatory deposit system if all stores would be required to redeem containers which they sold thus eliminating the need for an extra trip to a special redemption store. Although storing and returning the empty containers can be a nuisance, with a mandatory deposit system the consumer always has open the alternative of paying the price for the convenience of throwing the container away.

Although the final customer may or may not be indifferent to containers, that person is aware of price changes. In chapter 4 we noted that the beverage system costs would be lower under a mandatory deposit system. If the container mix under a mandatory deposit changed all bottles to refillables as assumed under both Container Mixes I and II, and if beverage companies passed their cost savings forward, there would be:

--No change in costs for customers who continue to purchase refillable containers.

--A decrease in costs of beverages for those one-way bottle users who switched to refillable containers, but an increase for those who switched to cans.

--An increase in costs for can users who continued to purchase beverages in cans, but a decrease if they changed to refillable containers.

These results are for average costs. Individual consumers might choose to throw away the deposit containers, which would greatly increase their costs when compared to those who returned the containers. The can users cost would probably rise, even if they returned the containers, because of additional handling costs.

The size of the effect on the average beverage cost to the consumer depends on the use of refillable bottles by the beverage industry under a mandatory deposit system and their willingness to pass cost savings forward. If one-way bottles are replaced by refillable bottles and the can share of the market continues to grow at it present trend (container Mix I), the average beverage cost to the consumer should decrease even though can beverage costs would have increased, because this increase would be more than offset by the rise in the use of the less expensive refillable bottles. If the refillable bottle not only replaces the one-way bottle but also takes over part of the can share of the beverage market (container Mix II), the average beverage cost to the consumer would decrease even more, again because of the increased use of the less expensive refillable bottle.

Any estimates about the changes in the price of the beverage to the consumer are based on the assumption that the lower costs of the beverage system under a mandatory deposit system would be passed along to the consumer. For a variety of business reasons, the industry's savings may

not be reflected in the cost to the final consumer, but industry's savings, as estimated in chapter 4, are potential savings for consumers.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

A mandatory deposit system that imposes a deposit on all beer and soft drink containers would convert the present beverage system from less than 30-percent refillable containers to one with 100-percent returnable and/or refillable containers. Several conclusions can be drawn from our analysis of what this conversion would involve.

First, litter and solid waste would be reduced under a mandatory deposit system. We estimated that beverage container litter would be reduced about 80 percent under this system. This translates into a possible 7 to 37 percent reduction in total litter. The solid waste reduction would be about 4 percent of the estimated 1985 post-consumer refuse, or about 8 million tons. The estimated reductions in litter and solid waste under the assumed mandatory deposit depend primarily on the change from a combined returnable and one-way container system to a completely returnable system.

Second, the consumer who did not return the container and therefore did not receive a refund of the deposit would pay more to have the privilege of throwing the container into the waste stream. Because a mandatory deposit system places a deposit on all containers, the amount of deposit not reclaimed by consumers would increase. The estimated increase in retained deposits ranges from $785 million to $587 million in 1981; this range depends on return rates and container mixes.

Third, certain business costs would increase due to handling a greater number of empty containers from the retail store to point of refilling or recycling. The eventual container mix and return rates would make some difference in how much these costs increased, but the capital, equipment, space, and labor costs to handle the returned containers would definitely rise under a mandatory deposit system because of the 100-percent coverage of a deposit law. If there were no substitution of refillable containers for one-way containers under a mandatory deposit law, then the costs of supplying beverages would go up by the amount of the costs brought about by handling previously nonreturnable containers. Even though we view the container mix which would evolve after implementation of a mandatory deposit law as uncertain,

we did assume that, as a minimum, refillable bottles would replace one-way bottles (Mix I). This change would create container cost savings which would help offset the rise in business costs noted above.

We analyzed the cost changes for the beverage industry for both the changeover period, assumed to be 3 years after implementation, and for a single year after changeover. We found that even during the 3-year changeover, the increased use of refillable bottles in the minimum container mix change (Mix I) would produce cost savings which would more than offset the costs of handling the large increases in returnable containers and changing filling equipment from one-way bottles to refillable bottles. Analysis of a larger change in container mix, with refillable bottles also substituting for many one-way metal cans (Mix II), had similar results. The analysis of the costs for the single year after the changeover (1981) showed that Mix I could be about $1.3 billion less costly than continuing the present way of packaging beverages, and that Mix II could be about $1.9 billion less.

The overall conclusion is that legislating a mandatory deposit on all soft drink and beer containers would

--reduce solid waste and litter,

--increase the level of retained deposits, and

--increase the business costs of handling returned containers.

The effect of return rates and container mix is not too important on these changes, because of the small share of deposit containers prior to the change to all deposit containers.

Other changes, including raw material use, energy use, business costs for filling containers, and container costs depend on the container mix. The container mix, which will be determined by the beverage companies, may not change much after implementation of a mandatory deposit. In such a case, the effect of a mandatory deposit on environment, other than solid waste/litter, and business will be minimal. To the extent that refillable containers replaced one-way containers, the environmental changes would be greater and the savings from producing fewer containers would more than offset the costs to industry of changing to mostly refillable containers.

AGENCY COMMENTS

The draft report was sent to four Federal agencies for review and comment. This reflects the many areas which would be affected if a mandatory deposit law were enacted and implemented. Their comments are reproduced in appendix IV.

The Federal Energy Administration (now part of the Department of Energy) suggested that the potential for lower costs in the beverage system should mean, given competitive markets, that consumer prices would be lower. They suggest that this should be highlighted in our final report. We note in chapter 4 that there seems to be potential for lower prices, but do not believe that there exists enough evidence of a direct link between lower industry costs and lower consumer prices to predict that a mandatory deposit system will result in lower prices.

The Department of Commerce is concerned that mandatory deposits on beverage containers might crowd out resource recovery as a viable solid waste option. We did not examine all the options which could achieve all or part of the purported benefits of mandatory deposit legislation, but rather concentrated on the effects of an option which we felt would be before the Congress for decision in the near future. The specific comments of the Commerce Department about the draft report are reproduced in appendix IV.

The Environmental Protection Agency and the President's Council on Environmental Quality agreed with the presentation of material in our draft report.

NON-FEDERAL COMMENTS

In addition to the Federal agencies which commented on the draft report, several industry groups, individuals, and environmental groups were asked to comment on and review the draft.

The industry groups, which included the U.S. Brewer's Association and the National Soft Drink Association took issue with some aspects of the draft report. They took exception to each of the main assumptions of beverage sales, container return rates, and container mix contained in our analysis. We have attempted to answer these criticisms in appendix V. We believe that each assumption which had to be made to analyze a potential Federal action is reasonable and that the analysis which flows from the assumptions is representative of the effects of a national mandatory deposit system as described in the report.

The industries which would bear the brunt of the economic adjustments believe that a mandatory deposit on beverage containers singles out the beverage industry and that the solid waste and resource problems which are evident in the United States today can be better solved through other means. We agree that legislative action should continue to explore ways to combat the problems of increasing solid waste burdens and depletion of raw materials. However, the policy trade-offs for such actions are not well documented and for that reason possible policy alternatives should not be disregarded just because there are other ways of achieving some of the same effects.

The environmental groups and individuals who responded to the draft report were in general agreement with the presentation.

RECOMMENDATIONS

The report was intended to compile in one study the major effects which would result from such a mandatory deposit system and to analyze the degree to which these effects would occur. The analysis we have made indicates that there are positive and negative aspects to the effects of a mandatory deposit system. The ultimate question of the appropriateness of a Federal mandatory deposit law must be answered by the Congress. We do have several recommendations to the Congress should it consider enacting such legislation.

A mandatory deposit system should impose a deposit on all beer and soft drink containers. Only by treating all containers equally can the system provide positive results because it is necessary to have as many containers as possible, whatever the mix, returned for reuse. Most legislative proposals call for such treatment, but we emphasize it since any beverage container not included would tend to negate the environmental benefits.

Any legislation should authorize money for a public educational program prior to implementation. Such a program should stress that a mandatory deposit system will be beneficial only if the containers are returned, and that the system will cost the consumer only if the containers are not returned.

Unemployment problems in specific areas may be severe. Any legislation should facilitate access to existing retraining programs and unemployment compensation to assist

affected areas. This would help those localities through the transition period and would aid skilled workers in redirecting their capabilities.

The deposits not refunded to the consumer should be divided between the beverage companies and the local jurisdictions responsible for trash disposal and litter cleanup. Many allocation formulas are possible, and the executive agency designated as the implementing agency should be responsible for its design. Prime considerations should be administrative ease of implementation and equity of the allocation.

A problem in assessing the effects of the various States' mandatory deposit systems has been the lack of good data on the period before and after implementation of the system. In view of this problem, any legislation should require that baseline measurements be taken and that continuing analyses be made. Such analyses will keep the responsible agency informed about the effectiveness of the program and the need for any changes. Measurements should be taken of litter and solid waste, beverage industry changeover costs, costs of goods sold, can recycling, and employment changes.

Returned cans cannot be refilled; they are valuable only as scrap. The price the bottlers and breweries would receive for the scrapped cans is less than the deposit which they could retain if the cans were not picked up from the retailer. Since this means that there will be no economic incentive to pick up the cans, a mandatory deposit law should give due consideration to the legal or administrative actions necessary to insure that the cans are treated the same as bottles in this respect. In addition, the legislation should provide some mechanism to encourage the recycling of these cans once they are returned. Without recycling, some of the environmental benefits of a mandatory deposit system will not be realized.

APPENDIX I

THE OREGON EXPERIENCE--

A SUMMARY

In 1971, the Oregon State Legislature enacted their Minimum Deposit Law which went into effect on October 1, 1972. This law required that a deposit be paid on all beverage containers. The results are perhaps the best documented and analyzed of all subsequent State and local mandatory deposit laws.

The purpose of the Oregon legislation was to encourage the return and reuse of beverage containers which would, in turn, reduce litter on Oregon's roadways, parks, and beaches. The bill's sponsor also believed that the bill would help to limit the use of nonrenewable resources, improve energy utilization, and reduce solid waste. The law provides for a minimum deposit of 5 cents on each beverage container and 2 cents on certified containers. In addition, pull tops on cans were banned.

The minimum deposit legislation was passed despite opposition from several sources. The opponents made four major predictions about the results of the law. It may be helpful to compare these predictions with the reported results of the law.

1. Litter would not be reduced significantly, if at all.

Several researchers have analyzed the litter data gathered by the Oregon State Highway Department before and after the law. They agree that total litter on a piece count basis decreased between 11 to 26 percent in the year after the law and 39 percent during the second year after the law. The amount of beverage container litter decreased within the range of 66 to 88 percent; one-way beverage containers made up over half of all beverage container litter. This indicates that much of the postlaw beverage container litter on the sample highways came from out-of-State beverage purchases. When the data were adjusted by us to include only deposit container litter after the law, and containers purchased in-State before the law, the amount of container litter decreased over 90 percent. This 90-percent beverage container reduction figure might more accurately reflect the effect which the Minimum Deposit Law had on litter in Oregon.

APPENDIX I

2. Beverage prices would rise and sales would fall after a mandatory deposit.

The 1973 retail price for beer in Oregon rose. Researchers show that this rise was apparently unrelated to the mandatory deposit. Prices in Washington, a neighboring, nonmandatory deposit State, also rose during the same period. In addition, total beer sales, by volume, grew in 1973 by 1.4 percent, and packaged sales, the affected submarket, were level on a volume basis. As Oregon's sales had been growing around 5 percent, the 1973 growth was not on the historical trend. Since 1973, annual growth in Oregon beer sales has resumed, both by volume and per capita. 1/ (See app. V for more on Oregon beer sales.)

Soft drink sales figures are not as precisely known as those for beer sales. Some reports State sales after the law were the same as in 1972, while other reports estimate an increase in sales of 10 percent.

3. Employment would decline.

Changes in the number of workers was addressed by the two key reports on the effects of the Minimum Deposit Law. 2/ The Oregon State University report estimated a net gain of 365 jobs, while the report made for the Oregon State Legislative Fiscal Office noted a net loss of between 165 to 227 jobs. These two reports are not too different, as the latter study did not include increases in retail employment. If the Oregon State University estimate of an increase of 575 jobs in the retail sector is added to the Fiscal Office study estimates, the two studies estimate net job gains of 365 and 348 to 410, respectively.

1/Annual growth (percent)

	72-73	73-74	74-75	75-76
Adult per capita	-0.5	3.7	1.9	2.2
Total	1.4	5.7	3.8	3.7

Source: Oregon Liquor Control Commission.

2/Applied Decision Systems, "Study of the Effectiveness and Impact of the Oregon Minimum Deposit Law," October 1974. Gudger, Charles M. and Bailes, Jack C., op. cit.

4. Return rates on deposit containers would fall after a deposit law.

Return rates on bottles increased after the deposit law. The two aforementioned studies estimated soft drink return rates at 80 and 95.7 percent before the law, and at 92 and 95.9 percent after the law. Prelaw beer return rates were estimated at 75 and 82 percent and postlaw at 95 and 86 percent. Much of the credit for the increased return rates has been given to the 100-percent coverage of the deposit, which makes returning the bottles easier.

The can return rate was, of course, not measurable before the law because deposits were not required on cans. In the first months after implementation of the law, the can return rate was very low. The rate was rising rapidly at the end of the year, and both reports estimated can return rates for the entire year at 70 percent. Our discussions with individuals and firms in Oregon indicated that bottle return rates remained high, with most estimates over 92 percent, and with can return rates estimated at about 80 percent.

The question remains whether Oregon's positive experience with a mandatory deposit law can be projected to the national level. We feel that several elements of Oregon's experience, such as return rates and sales changes, are representative and can be used. We did not feel that the changeover costs were representative, as firms serving more than the Oregon market could make nonmonetary adjustments to the Oregon law. With a national law, a mandatory deposit would eventually cause the adjustments to be made.

APPENDIX II

ANALYSIS OF VERMONT'S MANDATORY DEPOSIT LEGISLATION

Vermont enacted its first beverage container legislation in 1953. This bill banned the sale of beer and ale in non-returnable glass containers. The legislation lasted 4 years during which time the one-way can came into prominence and subverted the spirit, if not the letter, of the law. The law lapsed in 1957.

A second container law was enacted in 1972. The bill provided for 4/10 of 1 cent tax on all beverage containers, beginning July 1, 1972. This tax was to be replaced by a deposit of at least 5 cents on beer and soft drink containers on July 1, 1973. Due to administative problems, the deposit was not instituted until September 1, 1973.

In discussions of the Vermont mandatory deposit system, there were three points of contention: litter, costs to consumer, and tax revenues to the State. Their mandatory deposit experience has not been rigorously studied and there are many variables other than the implementation of a mandatory deposit system which may have affected the three indicators just noted. Thus, quantitative conclusions as to the effect of the bill are difficult to arrive at.

The usual reason given by environmentalists for instituting a mandatory deposit program is to reduce litter. Therefore, one could ask if, in fact, the amount of container litter was reduced in Vermont after the deposit was instituted. The Vermont State Department of Highways conducted a special litter evaluation project in which it compared June-September 1973 figures--the period after the legislation was implemented. This comparison shows that there was a reduction in the number of containers collected as litter: 75.8 percent in beverage cans; 76.5 percent in beverage bottles; and 76.1 percent of all beverage containers. There was a noticeable decrease in the amount of beverage containers found in litter after the bottle bill's implementation.

State of Vermont Special Highway Litter Evaluation Project
Summary of Beverage Containers Picked Up

	(June to September)	
	1973	1974
Cans	15,690	3,802
Bottles	9,713	2,280
All containers	25,403	6,082

The next issue is how the deposit program affects the price of the product to the consumer. The initial cost to the consumer, of course, went up at least equal to the deposit. This increase is repaid if the consumer returns the container. The Vermont law also requires a 1-cent per container reimbursement to the retailer for handling.

There are several estimates of the Vermont beverage prices before and after the bottle bill. One is by the U.S. Environmental Protection Agency 1/ and another is by Professor Nardworny. 2/ For beer, EPA figures show after the law went into effect, wholesale prices increased approximately 15 cents a six-pack in addition to the deposit. Nardworny states that the cost increased 19 cents. Bureau of Labor Statistics figures show there was a nationwide 10-percent rise in beer prices in 1973. The 10-percent increase on the 1972 price of Vermont beer would be 14 cents. Thus, if one accepts the EPA estimates of added cost, the price of beer did go up, over and above the deposit, but no more than the nationwide price and, therefore, should not be attributed to the deposit. If one takes the Nardworny figures, the price went up 3 to 4 cents a six-pack above the nationwide average.

Although much is made of the fact that neighboring New Hampshire beer prices did not go up as much, it must be noted that Vermont retailers must sell beer no lower than its wholesale price 3/ whereas New Hampshire retailers are not under the same constraint. A recent comparison of Vermont and New Hampshire's beer prices, which equalized the excise taxes and did not include the deposit, shows returnable bottles in Vermont cost less than one-way containers in New Hampshire by 3 to 9.5 percent.

Before discussing the soft drink figures, it should be noted that in 1973, the soft drink companies experienced a nationwide boom year. However, there was no gain in 1974 because of the sharp surge in sugar prices which caused the retail prices of soft drinks to increase significantly.

1/"Beverage Containers, The Vermont Experience," by Michael Loube, EPA, 1975.

2/"Some Economic Consequences of the Vermont Beverage Container Deposit Law," Milton Nardworny, Feb. 1975.

3/General Regulation No. 61, July 1976.

In Vermont EPA states that the soft drink prices did not change immediately after deposit legislation. EPA shows an eventual 5 to 10 cents a carton increase. Since prices did not increase until sometime after the program was in effect, this could be interpreted to mean that Vermont prices rose for the same reasons that caused national soft drink prices to rise in 1974. A recent study compared Vermont's and Connecticut's soft drink prices; an average of each shows Vermont's prices comparable to Connecticut's. Connecticut does not have a deposit law.

There are several variables which must be considered in order to put the final issue in the proper prespective. The winter of 1973 was the period of the Arab oil embargo. Gasoline was in short supply which affected tourism. Added to this was the unusually poor snow fall in Vermont that winter which meant fewer skiers.

The last issue is the effect of the legislation on State tax receipts. Beer is subject to a specific gallonage tax (7 V.S.A. §421) so any decrease in quantity of beer sold would directly affect tax revenues. Tax revenues from beer sales did decline after the deposit legislation compared to the previous year.

As was noted, soft drink sales nationally were excellent in 1973. This was reflected in Vermont also as sales were $16.3 million, $2.4 million more than the year before. Soft drink sales declined nationally in 1974 but State soft drink figures are not available. Because sales were probably affected by the substantial price hike, it is impossible to tell whether the mandatory deposit bill had its own specific soft drink sales effect. In addition, it is difficult to follow through the system and decide the effect on the Vermont sales tax revenue due to any decline in soft drink sales which might have been caused by the implementation of the mandatory system.

Against these facts of decreased sales one should note that one-ninth of Vermont's gross State product has been from tourism. The estimated tourists bear out the fact that 1973 and even 1974 were bad years for Vermont's biggest industry. The total number of tourists in 1973 was down 4 to 5 percent from 1972, and in 1974, tourist figures were down 10 percent from 1972. The skier visits illustrate more emphatically the point that the years 1973-74 were bad for an important part of Vermont's economy.

APPENDIX II

Vermont skier visits

Winter period (November to April)	Skier visits (millions of days)
71-72	2.65
72-73	2.30
73-74	1.65
74-75	2.80

The point is also raised that tax revenues decreased because consumers shopped in neighboring States which did not have a deposit on containers. No one has surveyed the phenomenon of the Vermont consumer who shops in New Hampshire, New York, or Massachusetts to find out why that person is buying outside the State; therefore, it does not seem valid to blame the deposit legislation for out-of-State shopping.

It must be concluded that Vermont is not a good case study. It has too many variables which are unquantifiable and which could have affected consumer decisions, including those we have enumerated. Before enactment of the legislation, no studies existed which would provide baseline numbers against which postmandatory program numbers could be compared.

In 1975 the Vermont Legislature toughened the 1973 law, making changes to be effective on January 1, 1977. The changes established a ban on flip top cans, on nonrefillable glass bottles, and on packaging material which is not biodegradable. The amendments passed the House by vote of 110 to 31 and the Senate by 29 to 1.

APPENDIX III

BUSINESS COSTS

Chapter 4 summarizes the economic effects of a mandatory deposit on the beverage system. The effects are discussed in terms of changes in the entire system and to each segment of the system, both during the changeover and annually thereafter. This appendix gives more detail about the figures in chapter 4.

1978-80 changeover analysis

After implementation of a mandatory deposit, there would be a period of adjustment which we have assumed would be completed within 3 years. During this period, 1978-80, the beverage industry would adapt its production components to the new system. Five components of the beverage industry would be affected by a mandatory deposit system--capital stock, labor, and three elements related to containers: new containers purchased, brewery-to-wholesaler shipment, and retained deposits. In this section, each component is discussed as are the specific effects on each segment of the beverage industry.

Changeover--Capital Stock Changes
Beverage Industries and Retail Stores
(1974 dollars--millions)

	Level of capital stock (1977)	1978-80 Baseline	1978-80 Mix I	1978-80 Mix II
Breweries	($913)	+136	+252	+956
Bottlers	($1,869)	+227	+446	+885
Beer distributors	($1,014)	+126	+233	+558
Soft drink distrs.	($1,333)	+177	+315	+445
Retailers	($ 75)	+ 2	+240	+272
	($5,204)	+668	+1,486	+3,116
Net difference--1978-80			+818	+2,448

The 1977 level of capital stock, $5.2 billion, is the undepreciated cost for equipment and buildings which would be affected by a mandatory deposit system. During 1978-80, industry would invest about $.7 billion in baseline new equipment and buildings. Under a mandatory deposit system, a container mix similar to Mix I--52 percent cans and 48 percent refillable bottles--would add about $1.5 billion to the 1977 capital stock, and Mix II about $3.1 billion.

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These estimates assume that the 1977 capital stock in place is fully utilized and that changes in the production mix would be met without resorting to noncapital intensive measures. Even if this overstates the cost of the changeover, the anaylsis is useful if one concentrates on the movement and relative size of the changes rather than on the absolute amounts. For example, Mix II could require about four times more investment in capital stock than a continuation of the baseline, while Mix I would require just over a doubling of the investment in capital stock.

In any case, a mandatory deposit system would require more capital stock than a nonmandatory deposit system to produce and deliver the same amount of beverage. The same relative changes would be required, regardless of the time involved in making the change. The change in capital stock needed to deliver 80 percent of the total beverage fillings in refillables as against 25 percent now will be about four times as great as the change to accommodate normal growth whether the change were to occur overnight or over 10 years. The longer the changeover period, however, the less the annual changes.

Worker years

The number of workers used would be affected by a mandatory deposit system and the change can be denoted in worker years for the 3-year changeover period, 1978-80.

Changeover-Worker Years
Beverage Industries and Retail Stores
1978-80

	Baseline	Mix I	Mix II
		(thousands)	
Breweries	80.2	81.0	91.3
Bottlers	137.2	139.0	144.3
Beer distributors	233.5	249.1	274.1
Soft drink distrs.	293.4	310.1	328.3
Retailers	16.0	92.0	99.0
Total	760.3	871.2	937.0
Net difference		+110.9	+176.7

Mix I would require a total of 111,000 more worker years during the 3-year changeover period, which is about 15 percent more than the worker years which would be needed under a baseline system. Mix II totals would be 23-percent higher than the baseline.

The worker years are converted into the wages presented in chapter 3 by the average industry wage in 1974 dollars. The brewery production workers average $12,960 a year, beer distribution $15,400, soft drink production $7,320, soft drink distribution $10,200, and retail workers $7,360.

Number of new containers

The number of new containers purchased would change with a mandatory deposit as can be seen from the following table and would depend on the reaction of the business community to the mandatory deposit system.

Changeover--New Containers Purchased
1978-80

	Baseline	Mix I	Mix II
	(billions)		
Bottles:	91.0	58.8	71.0
Refillable	9.0	17.4	29.6
One-way	83.0	41.4	41.4
Cans	174.5	174.5	113.9
Total	266.5	231.3	184.9
Net difference		-33.2	-81.6

One major changeover cost item in other reports has been the price of new refillable bottles which would be needed to build up the float, or inventory. This inventory buildup is shown on the refillable bottle line in the table above. Most float buildup analyses have not considered the fact that each new refillable bottle will replace several one-way containers each year. This table, therefore, shows the total number of new containers needed during the changeover, which we believe is a more valid way of determining changeover costs.

Mix I, which assumes that refillable bottles will replace one-way bottles and that the can share remains

APPENDIX III

the same, results in about a 13-percent overall reduction in container purchases, with 41.6 billion one-way bottles being replaced by 8.4 billion new refillable bottles. 1/

Even though refillables are roughly twice the cost of one-way bottles, total beverage container purchases would be approximately $1.1 billion less for Mix I than for the baseline. For Mix II, the 3-year decrease of 60.6 billion cans would be replaced by 12.2 refillable containers for an additional $2.6 billion decrease in cost, making Mix II total container purchase cost $3.7 billion less than the baseline.

The issue of the refillable bottle float is incorrectly stated unless the new containers which will not need to be purchased are considered in the calculations. The more refillable bottles in the beverage mix, the fewer new containers purchased and the lower the total cost of new containers.

The container costs used to calculate the monetary costs reported in chapter 4 for costs during the 1978-80 changeover are shown below. The prices were obtained from unpublished Bureau of Labor Statistics wholesale price series and various industry sources.

1974 Beverage Container Prices
(Prices are f.o.b. Factory per container)

	(cents)
Returnable bottles:	
Beer, 12 oz. "export"	5.87
Soft drink, 10-12 oz.	10.31
One-way bottles:	
Beer, 12 oz.	3.64
Soft drink, 12 oz.	5.01
Can:	
Steel	5.87
Aluminum	5.68

1/We assumed a velocity, or turnover, of 5 trips a year. This means that at a minimum, enough bottles for 20 percent of annual refillable sales must be available at the point of filling.

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Transportation of beer to wholesaler

The brewery/beer wholesaler labor and capital stock calculations do not take into account the higher cost of transport of refillable beer from brewer to wholesaler. Brewers ship their beer fairly long distances to their wholesalers, as opposed to the soft drink industry where the bottler and wholesaler are usually one and the same. To estimate this factor for the changeover period and for 1981, we took the total weight per 1,000 gallons of beer shipped and average truck and rail distances from the U.S. Brewers Association study of 100-percent refillable system 1/ as well as its estimates of 1974 shipping costs. The following table shows both the physical measure--total tons shipped between brewery and wholesaler--and the cost to hire this amount of shipping.

Changeover Factors
Brewery to Wholesaler Shipping Costs
1978-80

	Baseline	Mix I	Mix II
Tons shipped (millions)	77.2	79.9	94.8
Shipping costs (1974 dollars--millions)	$1,081	$1,118	$1,327
Net difference	—	$+37	$+246

The changeover cost differences are not too great, as the analysis included the weight of the beverages and packaging as well as the weight of the container. Shipping 1,000 gallons of beer in aluminum cans weighs 9,000 pounds while refillable glass containers would increase the weight to 16,500 pounds, and one-way glass bottles would weigh 13,300 pounds. We did not calculate the cost to transport empty containers back to the brewery as no one has estimated backhaul distances or the costs.

1/"A Study of the Impacts on the USA of a Ban on One-Beverage Containers," Busch Center, University of Pennsylvania, for USBA, December 1976, p. B-12 and p. 67, Energy Appendix.

Unreclaimed deposits

The last important factor to be considered is the number of deposit containers not returned.

Changeover Factors
Deposit Containers Not Returned 1978-80

	Baseline	Mix I	Mix II
		(billions)	
Total deposit containers sold	88.4	345.9	345.9
Total not returned	10.7	52.0	46.0

Every container not returned is worth 5 cents to the originator of the deposit. This so-called retained deposit figure would rise during the 3-year changeover from $0.5 billion under the baseline to $2.3 billion for Mix II. Retained deposits are now used to partially offset the purchase of refillable bottles which replace those not returned. Containers not returned are higher in Mix I than in Mix II because the can return rate is lower than the bottle return rate and Mix I assumes more cans.

SUMMARY OF CHANGEOVER FACTORS

Changeover
1978-80

	Baseline	Mix I	Mix II
Capital stock	$0.7 billion	$1.5 billion	$3.1 billion
Worker years	760 thousand	871 thousand	937 thousand
New containers	267 billion	231 billion	185 billion
Beer transported (tons)	77 million	80 million	95 million
Retained deposits	$0.5 million	$2.6 million	$2.3 million

A summary of net changes for beverage filling, beverage wholesaling, and retailing is shown in the following table which indicates the net changes of Mix I and Mix II from the baseline.

Net Changeover
Mandatory Deposits versus Baseline
1978-80

	Mix I	Mix II
Capital stock	+$0.8 billion	+2.4 billion
Worker years	+111 thousand	+177 thousand
New containers	-36 billion	-82 billion
Beer transport (tons)	+3 million	+18 million
Retained deposits	+$2.1 billion	+$1.8 billion

ONGOING CHANGES AFTER THE CHANGEOVER PERIOD

The 3-year changeover period to a mandatory deposit system would result in a system with an industry determined container mix and the stock of equipment, labor force and materials (containers) necessary to produce and deliver that container mix. Maintenance of and additions to the capital stock would be required on an ongoing basis, as would continuing adjustments to changing sales levels. The costs for these ongoing adjustments will be discussed in this section.

The baseline ongoing changes can be calculated and compared to the estimated ongoing changes for Mixes I and II. Pronounced cost reductions would occur under a mandatory deposit system because the large changes in capital stock purchases would have been accomplished during the 1978-80 changeover and materials costs would remain low.

The following table details the 1981 ongoing cost changes in capital stock, and employment and container costs for the beverage and retail industries.

1981 Ongoing Changes--Beverage and Retail Industries

	Baseline	Mix I	Mix II
Change to Capital Stock: (1974 dollars--millions)	$79.5	$87.6	$145.9
Breweries	23.8	22.0	38.1
Beer distributors	18.7	20.1	36.9
Soft drink bottlers	22.5	23.4	39.5
Soft Drink distributors	16.3	17.1	22.2
Retailers	-1.8	5.0	9.2
Employment (workers)	257,400	308,400	360,100
Breweries	24,800	25,500	32,200
Beer distributors	76,600	87,000	114,100
Soft drink bottlers	43,800	45,000	48,500
Distributors	103,900	114,000	127,200
Retailers	8,300	36,000	38,000
Container Costs at point of filling*(1974 dollars--millions)	$6,305.8	$5,244.7	$3,618.1
Breweries	3,028.8	2,680.7	1,518.3
Soft drink bottlers	3,277.0	2,564.0	2,099.8
Beer transported (million tons) Breweries to distrs.	26.9	28.8	38.6
Retained deposits (1974 dollars--millions)	$146.6	$931.5	$733.4
Soft drink bottlers	127.7	463.1	403.9
Breweries	18.9	468.4	329.5

*Containers are treated differently in this analysis of ongoing cost changes than they were in the analysis of changeover costs. The container cost is not the expense of purchasing new containers during the year, but the per filling cost for filling all containers during 1981. These container costs also include direct packaging costs.

The ongoing changes for beverage and retail industries are translated into monetary terms in the following table.

Ongoing Changes--Beverage and Retail Industries

	Baseline	Mix I	Mix II
Changes to capital stock	$ 79.5	$ 87.6	$ 145.9
Employment	2,944.1	3,437.5	4,108.1
Containers, per filling	6,305.8	5,244.7	3,618.1
Beer transported	376.8	402.7	540.2
Retained deposits	-146.6	-931.5	-733.4
Total (note a)	$9,559.6	$8,241.0	$7,678.9
Net difference		-$1,318.6	-$1,880.7

a/Retained deposits are subtracted to arrive at the total.

CONTAINER INDUSTRIES AND PRIMARY METALS

Metal can producers depend on the one-way beverage can for about 50 percent of their output. Any reduction in that market will decrease their sales, employment, and need for new capital investment. Glass container production is also about half for beverage containers, and decreased demand for one-way glass bottles would have the same effect as for metal can firms. The primary metal producers would also be affected by reductions in can production.

We used the Chase Econometrics Associates, Inc., inter-industry long-term forecasting model to estimate capital investment changes in the container and primary metals industries. The number of containers required in the baseline and Mix II were used in the model to set up all baseline and Mix II levels throughout the 90 and 180 industry matrices. This means that changes in the number of containers were picked up in the primary metals investment levels as well as in the container industries.

Mix I container levels were not compared to the baseline in the model because only glass producers would be affected. That capital investment change was interpolated from the Mix II estimate for glass and glass products.

Employment changes for container producers were directly calculated using labor output coefficients from the FEA study, while the employment changes for the steel and aluminum industries were estimated within the model.

The cost estimates for the baseline and both mixes follow.

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Estimated Costs for the Container Industries--1981
(1974 dollars--millions)

Company:	Cost items	Baseline	Mix I	Mix II
Can producers	Capital investment	$ 295	$295	$223
	Employment a/	911	911	598
Bottle producers	Capital investment	470	411	429
	Employment b/	743	451	520
Total beverage container producers	Capital investment	765	706	652
	Employment	1,654	1,362	1,118
	Total	$2,419	$2,068	$1,770
Aluminum industry	Capital investment	1,147	1,147	1,141
	Employment	5,454	5,454	5,435
Steel industry	Capital investment	2,680	2,680	2,619
	Employment	11,425	11,425	11,319
Total primary metals industry	Capital investment	3,827	3,827	3,760
	Employment	16,879	16,879	16,754
	Total	20,706	20,706	20,514
Grand Total		$23,125	$22,774	$22,284
Net difference from baseline.			$ - 351	$ - 841

a/At a wage of $11,400 a year.
b/At a wage of $9,500 a year.

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INDIRECT INDUSTRIES

The microeconomic model mentioned above represents the total U.S. economy by 90 and 180 industry groups. The directly calculated changes in capital stock and employment from Mix II were placed in the model, and the model then estimated the resulting economy-wide changes. Analysis of the changes in the 90-industry matrix revealed that 9 of the supplier and indirect industries would have changes that could be attributed to the change in containers produced.

The changes in these industry groups, including mining, paper containers, and motor vehicles, were added and are represented in the following figures. Mix I was not used for indirect industry calculations because its changes would be even smaller than Mix II.

Net Changes in Indirect Industries
1981
(1974 dollars--millions)

	Mix I	Mix II
Capital investment	Negligible	-$19
Employment (wages of $8,876)	Negligible	-$78

APPENDIX IV

FEDERAL ENERGY ADMINISTRATION
WASHINGTON, D.C. 20461

July 29, 1977 OFFICE OF THE ASSISTANT ADMINISTRATOR

Mr. Harry S. Havens
Director
Program Analysis Division
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Havens:

Thank you for the opportunity to review the draft GAO report on the effects of a national mandatory deposit on beverage containers. In general the report, which is a digest of various other reports on this subject, is a well written and balanced presentation. Even with differing assumptions and a modified data base, the GAO study conclusions were consistent with the results of the FEA sponsored study on the same subject. Simply stated these results are that a deposit law would save energy and, although causing some shifts in industrial activities and employment, could save consumers some money.

In the body of the report it is noted that the average price of beverages will fall under a deposit system. This is true for both scenarios examined and is a key point that should be added to the conclusions section. [See digest p. ii and pp. 37 to 39 for a discussion of this point.]
The recommendation that any legislation include funds for a Federal public education program seems to be unnecessary and something best left to private industry. Also the recommendation that deposits not refunded to the consumer be allocated between the beverage companies and local governments may be costly to implement. It would require a significant government presence, in terms of money and manpower, in an area that currently is completely handled by private industry. While I understand the desire of GAO to return some of these funds to local government (instead of allowing all of these funds to be

kept by industry), under a competitive situation the price of beverages will be reduced based on the amount of deposits retained. This would benefit all beverage consumers, while still retaining a penalty (deposits lost) to those consumers who do not return their containers for reuse or recycling. In addition, the use of retained deposits by industry could mitigate any potential negative pressure on profits. [See GAO note on this page.]

If we can be of further assistance, please let us know.

Sincerely,

C. William Fischer
Associate Administrator
Policy and Program Analysis

cc: Monte Canfield, Jr.

GAO note: If the Federal Government passes and implements national mandatory deposit legislation in the future, we believe that all prudent steps should be taken by the Congress to help insure its effectiveness. One way, reflected in our recommendation, is to inform the beverage consumer prior to implementation about the operation and intent of the law. The Congress need not design the information effort, but the implementing agency should have the authority and funds to publicize the law prior to implementation if other sources of information seem to be inadequate.

Our recommendation to make some of the retained deposits available to local jurisdictions emphasizes the relationship between the container not returned and the high probability that it would become litter or solid waste--usually cleaned up or landfilled by local jurisdictions. We believe that the implementing agency should investigate the retained deposit sharing option and evaluate equitable and viable alternatives. One alternative would be to allow the brewers or bottlers to keep the moneys from refillable bottles not returned, but share all or part of the deposits from cans not returned. Under the mandatory deposit system assumed in this report, the retained deposits from cans not returned would be $640 million under Mix I in 1981 (about 12 cents a case), and $244 million under Mix II (5 cents a case). [See pp. 37 to 39 and 63 to 66 for discussions on the potential cost savings under a mandatory deposit system.]

APPENDIX IV

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Administration
Washington, D.C. 20230

5 AUG 1977

Mr. Harry S. Havens
Director, Program Analysis Division
Room 5001
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Havens:

This is in reply to Mr. Henry Eschwege's letter of June 24, 1977, requesting comments on the draft report entitled "A National Mandatory Deposit: What Would Be The Effects?"

We have reviewed the enclosed comments of the Assistant Secretary for Domestic and International Business and believe they are responsive to the matters discussed in the report.

Sincerely,

Elsa A. Porter
Assistant Secretary
for Administration

Enclosure

APPENDIX IV

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Domestic and International Business
Washington, D.C. 20230

JUL 2 9 1977

Mr. Harry S. Havens
Director
Program Analysis Division
Room 5001
General Accounting Office
441 G Street, N. W.
Washington, D. C. 20584

Dear Mr. Havens:

This letter is in response to your request for the views of the Department of Commerce on GAO's proposed report entitled A NATIONAL MANDATORY DEPOSIT: WHAT WOULD BE THE EFFECT?

I am enclosing a compilation of comments on the GAO report for your consideration. A primary concern of the Department at this time is the broader issue of the disposition and recovery of solid waste. The issue of whether or not to federally mandate beverage container deposits is clearly one option to be considered, but we would hope that it might be considered as one of many interrelated options. Section 8002(j)(d) of the Resource Conservation and Recovery Act of 1976 [42 U.S.C. 6982(j)(D)] mandated the government to undertake comprehensive studies of "the appropriateness and feasibility of employing as a resource conservation strategy the imposition of solid waste management charges on consumer products, which charges would reflect the costs of solid waste management services, litter pickup, the value of recoverable components of such products, final disposal, or any social value associated with the nonrecycling or uncontrolled disposal of such product." We would suggest that you provide the Resource Conservation Committee copies of your final report for consideration in the formulation of their report to the President and the Congress.

Sincerely,

for Frank A. Weil
Assistant Secretary for
Domestic and International Business

Enclosure

APPENDIX IV

Department of Commerce Comments on GAO Draft Study: A National Mandatory Deposit: What Would be the Effects?

General

This study, as well as many others produced since 1974, assumes high return rates, no effect on beverage sales, and an orderly transition to new packaging mixes, etc. Under these conditions the benefits of the legislation appear to outweigh the adverse impact. However, if this optimism is not warranted, the scale could tip in the other direction.

A second concern, and one which has not been adequately treated in this or most other beverage container studies is the relationship between legislative actions which limit the production of valued waste vis-a-vis the economic viability of large-scale solid waste recovery. It has been estimated that between $1.70 and $2.20 in potential revenues (per ton) would be removed from recoverable waste by container legislation. This marginal difference in recoverable waste value can and has affected decisions concerning investment of capital in resource recovery facilities. Accordingly, the bulk of the waste (95%), which contains similar materials and organics and which can be readily separated and burned as a fuel, continue to be landfilled and not recovered.

This particular issue and other legislative and policy actions which might be taken to foster material conservation and recovery will be evaluated in detail during the next 18 months as mandated by section 8002(j) of the Resource Conservation and Recovery Act of 1976. It would be hoped that decisions regarding beverage container legislation can be delayed until the evaluation of this proposed policy has been undertaken within this broader context.

Specific

Page 17. The point is made that return rates decrease as the refillable share of the market falls. The implications are that an increase in refillable containers will result in increased return rates. The underlying reason for this apparent correlation should be considered in greater detail, for example, is the decrease in return rates causing soft drink manufacturers to use disposables because of cost considerations and, are more refillables discarded because of a change in life style or increased disposable income? [See p. 13 for a discussion of this point.]

Page 18. Everyone is forced to use Oregon statistics because they are the only ones available. Oregon, however, is far from representative of the U.S. [See pp. 89 and 90.]

[See GAO note p. 75.]

Page 26. The assumption that "...the ratio of beverage container litter to total one way containers would stay the same..." drives the whole analysis (i.e. results are governed by the assumption). What is the basis for this assumption? [See p. 24.]

Page 37a. The various cost analyses dealing with beverage pricing indicate that beverage prices will decrease because container cost savings will be passed-through to the public. Yet in this section the implicit assumption seems to be that foregone deposits will be retained by the beverage producer. Consistency is needed in the assumptions. Gains from deposit forfeiture are likely to be reflected in beverage pricing. Isn't the underlying assumption in the cost analysis that any savings will be pushed through to the consumer? [See pp. 37 to 39.]

Page 37 and elsewhere: The discussion of costs is very hard to review since the numbers must be taken at face value. One observation is the absence of the "bottle float" and its effect on investment and phase-in. In a system dominated by returnable glass, such as mix II, the float costs alone can be expected to approach 1 billion dollars. This warrants discussion.
[See pp. 33, 60, and 61.]

Page 45: Based on analysis presented in the report (and the unstated assumption that beverages are priced to reflect actual production and distribution costs) these stated findings follow. However, it has been suggested by many that returnable beverages are often subsidized by their disposable counterpart. (See study of "The Effectiveness and Impact of the Oregon Minimum Deposit Law" Applied Decision System, October 1974). If this is a prevalent policy, those now buying refillable containers may pay more for the same container after legislation. [See p. 85.]

Page 48: With a transition from baseline to mix I, it can be shown that the number of glass beverage containers produced annually will be substantially less than glass beverage containers produced under baseline conditions. [See pp. 33, 60, and 61.]

Page 51: Since the issue of public education and federal subsidy of the unemployed have not been discussed in the report it is suggested these be treated more extensively or deleted. The retaining and unemployment issue has broad implications and requires a great deal more consideration. The recommendation dealing with an unrefunded deposit has been discussed previously (see comment dealing with page 37a). [See GAO note, p. 70.]

Page 52: The collection of baseline data and assessment of program effectiveness over time is an excellent recommendation.

GAO notes: Deleted comments refer to material discussed in our draft report but not included in this final report.

Page references in this appendix refer to our draft report and may not correspond to the pages of this final report.

APPENDIX IV

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N. W.
WASHINGTON, D. C. 20006

August 15, 1977

Mr. Harry Havens
Director, Program Analysis Division
U.S. Government Accounting Office
Room 5001
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Havens:

We have reviewed the draft report "A National Mandatory Deposit: What Would be the Effects?" While it does not contain new empirical data, the draft provides a useful assessment of the major issues involved in any mandatory deposit scheme and of the Vermont and Oregon experience with mandatory deposits. It is encouraging to see GAO's willingness to analyze and evaluate major public policy issues prior to serious Congressional action so as to highlight implications of the choices available to the Congress in its deliberations.

We have already communicated a number of minor comments to the author. However, there are areas which you may wish to consider for further analysis and inclusion in the report:

- Moving Appendix III: Business Cost Tables forward into the main report and expanding the discussion to include an assessment of the impact of mandatory deposit legislation on the capital market.

- Including in the Environmental Effects chapter a discussion of the impacts of water withdrawal and consumption of the various schemes. [See p 22.]

° Since the industry argues that mandatory deposits are an infringement on consumer choice and that regional variations with respect to use of refillables are largely a function of storage and inventory and life style (transportation habits), some discussion of these issues in terms of your findings would be useful to public debate which will surely result in any discussion of a national mandatory deposit scheme. [See GAO note on this page.]

We would hope the final report could be published fairly soon.

Sincerely,

Edwin H. Clark, II

Edwin H. Clark, II
Acting Executive Director

GAO note: Consumer choice is discussed in ch. 5. We did not specifically analyze regional impacts.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 28 1977

OFFICE OF
PLANNING AND MANAGEMENT

Mr. Henry Eschwege
Director, Community & Economic
Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

We have reviewed your draft report entitled "A National Mandatory Deposit: What Would Be The Effects?"

In general, we find this report to be extremely well done. It is comprehensive and indicates that a great deal of effort was devoted to understanding the entire beverage container manufacturing and distributing system. The assumptions that were made are consistent with studies that we and others, including the Federal Energy Administration, have done. We therefore find that they are useful and probably representative of the range of possibilities that might reasonably be expected under a national mandatory deposit law.

One comment we would offer, without recommendation, is with regard to the disposition of unrefunded or retained deposits. We would agree that the sums involved are significant ($825 to $1,298.3 million in 1981). However, the analyses and recommendations on pages 37a and 37b appear to be perfunctory in view of the amounts involved. We would suggest more consideration be given in the report to additional uses for these funds, other than an unspecified division between governmental units and beverage companies. [See GAO note on p. 70.]

Comments on minor technical matters and for language clarification have been made available to your staff informally.

Sincerely yours,

William Drayton Jr.
Assistant Administrator
for Planning and Management

GAO notes: The retained deposit figures used in this final report for 1981--$588 million to $785 million--are lower than those presented in the draft report ($825 million to $1298.3 million) because of the re-estimated beverage consumption projections and the increase in can return rates from 70 percent in the draft report to 80 percent in this final report.

Page references in this appendix refer to our draft report and may not correspond to the pages of this final report.

REPLIES TO NON-FEDERAL COMMENTS

Because of the controversial nature of mandatory deposits on beverage containers, the draft of this report was sent not only to Federal agencies, as is our practice, but also to beverage-related industries and public interest groups for their comments. (See list at end of this app.) All suggestions were carefully considered and those which we believed had merit were incorporated into the body of the text. Other suggestions and critical remarks were not accepted for incorporation into the text. We would like to explain why they were not.

We have not reproduced non-Federal comments. The synopsis of the major comments which follows was made by us and concentrated on recurrent comments about our study.

Scope of the analyses

Several reviews criticized the scope of the report. During the survey stages of this review, thought was given to analyzing the effects of a mandatory deposit system and then comparing the results with alternative methods of reaching the same objective, e.g., reduced energy and raw material use plus reduced litter. The immensity of such a project soon became obvious and a decision was made to limit the scope of the report to the analysis of the mandatory deposit system because this aspect of the issue is, at present, under consideration by the Congress. We are not thereby asserting that such a system is the only or the best way to achieve the above-mentioned objectives.

Because the scope of this report is limited to mandatory deposits, the beverage industry may appear to be the scapegoat for the Nation's litter, natural resources, and environmental problems. Unfortunately, when one analyzes a limited subject such as mandatory deposit system, a few industries do bear the brunt of the discussion. This does not mean that only those industries are totally responsible. Witness the fact that 60 to 90 percent of litter is not beverage related. Still, that part which is beverage related is not biodegradable and the mandatory deposit is a viable means for reducing its litter potential.

Another criticism, along these same lines, suggests that the quantity of energy and natural resources which could be saved is so small as to not be worth the bother of an all-deposit system. We cannot deny that the energy savings even

from container Mix II, when compared to the overall energy demand, is small--2/10 of 1 percent--but, when compared to the other energy conservation programs now under consideration by the Congress, it is certainly comparable. Each energy conservation program is not such that it alone will make a huge dent in the Nation's total energy demand. Only in the aggregate do these individual programs help to reduce energy consumption. A mandatory deposit system is not the definitive solution to the problem of the growing American demand for energy, but it can be viewed as one step on the road to energy conservation.

Return rates--bottles and cans

Another source of criticism was the assumed return rate for refillable bottles of 90 percent under a future national mandatory deposit system. Several reviewers (National Soft Drink Association, U.S. Brewers Association, Can Manufacturers Institute) commented that the refillable bottle return rate assumption was too high. They estimate return rates between 60 percent (2.5 trips) and 75 percent (4 trips). One group, Environmental Action, went in the other direction, noting that the trippage in areas which have mandatory deposits, such as Oregon and Vermont is much higher than a 90-percent return rate.

The USBA uses a formula to calculate the trippage rate of off-premise (retail sales) returnable beer bottles. Since many reviewers based their assumption of return rates on this formula, we believe it is important to explain why the formula was not used in this report.

The formula is:

[on-premise (bars and restaurants) market share x on-premise return rate] + [off-premise market share x off-premise return rate] = returnable bottle return rate.

The USBA does not know what the off-premise return rate is but believes it can be determined using the following assumed figures for the other elements of the equation:

.85 = assumed on-premise market share for refillable bottles

.98 = assumed return rate for on-premise refillable bottles (equal to 50 trips)

.15 = assumed off-premise market share for refillable bottles

.93 = overall return rate for refillable bottles (based on FEA's 1973 calculation of national return rates for beer)

y = off-premise return rate for refillable bottles

$\therefore$ $(.85 \times .98) + (.15 \times y) = .93$

$y = .65$ or 2.9 trips

We have two problems with the USBA results. First, the formula is very sensitive to the slightest change in any of the numbers, so that it is misleading to assert that any return rate, calculated by using the formula, is precise. The following examples will demonstrate this. Instead of using the FEA's overall return rate of .93 from 1973, we recalculated the return rate based on 1975 data. The overall return rate becomes .917 making the off-premise return rate .56, or 2.3 trips.

Example 1: If the assumed off-premise market share is increased to 25 percent and the assumed on-premise share is decreased to 75 percent, (USBA itself uses 85 percent as a maximum) solve for the unknown off-premise return rate:

$(.75 \times .98) + (.25y) = .917$

$y = .728$ or 3.7 trips

Example 2: If the assumed on-premise return rate is decreased by 3 percent to 95 percent (USBA's 98 percent is based on the strength of a refillable bottle) solve for the unknown off-premise return rate:

$(.85 \times .95) + (.15y) = .917$

$y = .73$ or 3.7 trips

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Example 3: If the assumed on-premise market share is decreased to 75 percent and its return rate is decreased to 95 percent (combining examples 1 and 2) solve for the unknown off-premise return rate:

$$(.75 \times .95) + (.15y) = .917$$

$$y = .818 \text{ or } 5.5 \text{ trips}$$

The obvious sensitivity of this formula to reasonable alternative assumptions about on-premise return rates and market shares makes it difficult to place any credence in submarket return rates calculated by this method. A decrease of 3 percent in the on-premise return rate increases the off-premise return rate by 17 percent, or over a full trip. (See example 2 above and compare it to the .56 return rate calculated with 1975 data).

However, if we felt confident that the USBA's assumptions were valid, there would be little need to be concerned about this sensitivity. Our second problem, however, is with these assumptions. One large American brewer's marketing patterns throws the assumed on-premise return rate (.98 percent) into serious question. This brewer first sells its bottled beer in the on-premise market as a deposit bottle. The return rate is approximately 95 percent. The returned bottles are washed, filled and then sold as one-way bottles in the off-premise market.

In order to accommodate this marketing practice, a third submarket for refillable bottles must be added, the 6 percent of Brewer X. 1/ The return rate assigned to this market can be based on the actual life of the bottle: Each bottle is scheduled to be filled two times. The first time, when the bottle is used as a "bar" bottle, 95 percent of them are returned. The second time as one-way bottles, none are returned. The average return rate is .95 ÷ 2 or .475, equal to 1.9 trips. In a less favorable view, each "bar" bottle filling during the year could be considered to be offset by the purchase of a new bottle. In such a case, each bottle only

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1/Brewer X has .06 of the returnable beer bottle market and it is all on-premise. For the other brewers, it is estimated by the USBA that 15 percent of the returnable beer bottle market is off-premise; therefore, other brewers have 79 percent of the returnable beer bottles in the on-premise market.

makes one trip, which means the bottle does not have a return rate. We used .475 as the new submarket's on-premise return rate because it will cause the minimum deviation from the USBA's results.

The following elements would be used to solve for the new off-premise return rate:

.06 = Brewer X's returnable beer bottle market share (all on-premise)

.475 = Brewer X's on-premise return rate

.79 = all other brewer's on-premise returnable beer bottle market share

.98 = all other brewer's on-premise return rate

y = off-premise return rate

$$(.06 \times .475) + (.79 \times .98) + .15y = .917$$
$$y = .762 \text{ or } 4.2 \text{ trips}$$

Then, using the alternative assumptions in example 3, we solved for the off-premise return rate:

$$(.06 \times .475) + (.69 \times .95) + .25y = .917$$
$$y = .932 \text{ or } 14.7 \text{ trips}$$

This brewer's unique marketing strategy causes a wide discrepancy in the results of the calculation--2.3 trips in USBA's formula versus 14.7 trips in the adjusted formula. Because of the uncertainty of the USBA's numbers and the acute sensitivity of the formula, we preferred to use the national inventory model (based on 1947-1975 experience) and the Oregon experience, as stated on pages 12 to 16.

Reviewers also questioned the implication that because return rates have decreased as refillable bottle market shares decreased (see p. 13) the reverse would hold true. The National Soft Drink Association in particular cautioned that such an implied assumption disregards the very important human element which is involved. We agree that tastes and consumer buying habits may have changed so greatly that a completely returnable system might not cause return rates to rise. The text has been reworded to indicate that there are two interpretations to the relationship between market share and return rate. As was noted on page 13, though, the return

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rate has not fallen as low as 90 percent, even with the present small market share of returnable bottles. In fact, the 90-percent rate assumed in this report reflects a lower rate than the 1975 return rate for refillable bottles.

In summary, we believe that the assumption of a 90-percent return rate is a valid, minimum value for refillable bottles. The economic incentive plus the ease of return to many outlets should maintain a return rate of 90 percent. This assumption is lower than the return rates achieved in Oregon, and also lower than the rates computed for the national refillable bottle market to date.

The can return rate assumption of 80 percent used in the final report is 10-percent higher than the assumption used in the draft report, but is still below the assumption for bottle return rates. Several reviewers (Can Manufacturers Institute, Environmental Action) could see no difference to the consumer between a can with a deposit and a bottle with a deposit. We agree that there is no difference when viewed in that manner, but the historical evidence is not available to support a 90-percent can return rate. The U.S. Brewers Association suggested that we review the Department of Defense ongoing mandatory deposit experiment, which places a mandatory deposit on containers which are sold on selected military bases, to better document a return rate. We were able to obtain unpublished data on one Army base, Fort Knox, which has 6 months experience with a basewide mandatory deposit. The results follow.

Beverage Container Return Rates--Retail Sales

	April	May	June	July	August	September
Fort Knox, Ky.	.60	.73	.79	.88	.82	.91

Source: Telephone conversation with Franklin Associates, Prairie Village, Kansas.

Can sales were 84 percent of total sales in September. This means that if all bottles were returned, cans were being returned in September at a rate of about 86 percent. Along with the 80-percent can return rate reported for Oregon

for 1976, 1/ this data base tends to support a return rate higher than our original draft estimate of 70 percent. An 80-percent return rate for cans was assumed to reflect this new information.

Sales levels

Our report assumes that sales of beverages would be no different with a mandatory deposit system than with a continuation of the existing system. Several reviewers predict that beverage sales will fall if a national mandatory deposit is implemented. Their prediction is based on one or both of the following assumptions:

--A mandatory deposit system will cause beverage prices to rise which will cause people to buy less of these products.

--The loss of throw-away convenience will reduce the consumer's desire to purchase beverages which in turn will cause sales to drop.

Analysts who have studied this area do not agree that the prices will necessarily rise under a mandatory deposit system. The FEA report estimates that consumers will save approximately $2.6 billion in 1982 if the mandatory deposit beverage system consists mostly of refillable bottles. Others, noting the existing pattern of lower prices for refillable bottles compared to one-way containers, conclude a mandatory deposit system with mostly refillable bottles will not result in price rises. The USBA asserts that "* * *returnable bottles in the market are subsidized by convenience packaging," and with a beverage system which consists only of refillable bottles, the retail price of beer would be higher than it would have been if one-way containers were used.

Our analysis indicates that systemwide costs would be reduced under a mandatory deposit system (see ch. 4 and app. III). Unless cost reductions were passed along by brewers and bottlers, this would not result in a reduction in consumer prices. At the same time, price increases need not occur with a competitive market.

1/State of Oregon, Department of Environmental Quality, "Oregon's Bottle Bill - The 1977 Report," Salem, Oregon, 1977.

The argument that loss of throw-away convenience will result in loss of sales stems from the beverage industry's belief that their sales have increased in part because of the convenience provided by throwing away the container after drinking the beverage. Because they assume a mandatory deposit system will eliminate this convenience, they conclude their sales will decline. A mandatory deposit, however, will not eliminate the consumer's option to dispose of the container in the garbage or as litter. The deposit would merely cause the price to rise by the amount of the forfeited deposit. Certain consumers will choose this option and this fact is reflected in our assumed return rates of less than 100 percent.

Also the beverage industries do not believe the consumer values the convenience of throwing containers away enough to pay the existing higher price for beverages in one-way containers plus forfeiting the deposit. We examined Oregon's experience with an actual mandatory deposit system to see how the higher prices to consumers who did not return containers and the increased inconvenience to those who did return containers actually affected beer sales.

The following chart gives the total beer consumption in Oregon before and after the October 31, 1972, implementation of its Minimum Deposit Law.

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TOTAL OREGON BEER SALES

Actual 1961-1976
Estimated based on 1961-1972 trend

(000 omitted)

Year	Actual (barrels)	Estimated (barrels) Linear	Logrithmic
1961	821.2		
1962	854.9		
1963	891.2		
1964	945.9		
1965	1,021.4		
1966	1,072.0		
1967	1,133.5		
1968	1,151.3		
1969	1,228.5		
1970	1,314.6		
1971	1,395.8		
1972	1,469.6		
1973	1,489.8	1,490.8	1,541.2
1974	1,574.3	1,549.6	1,625.7
1975	1,633.9	1,608.5	1,714.8
1976	1,695.0	1,667.3	1,808.7

Source: Oregon Liquor Control Commission, Annual Brewery to Wholesaler Sales
Regressions calculated by GAO

USBA analysis of Oregon beer sales data from 1961 to 1972 caused them to state that beer sales in Oregon would have been higher after 1972 without a mandatory deposit system. Their analysis did not cause us to change our assumption that beverage sales on the national level would be the same with or without a national mandatory deposit law. One reason that we did not change is that the 1961-1972 base period used by USBA is a short one for estimating future sales; another is that a trend line analysis with consumption explained by time assumes that time is a good proxy for all the variables which might explain beer consumption, but are not exactly known for Oregon. USBA did add a population variable by calculating consumption on a per capita basis, but that does not mask the fact that

if beer consumption rose for each year in the period 1961-1972--which it did for Oregon--the estimation of future beer consumption will simply continue that upward trend.

We do not believe that time is a good proxy for variables which influence beer sales, nor do we believe that continued growth in beer consumption is guaranteed in any State. State-by-State analysis of per capita beer sales from 1968-1975 shows that about a dozen States have had relatively stable beer consumption--average per capita growth ranging from 0.2 to 1.5 percent each year. Each of these stable consumption States have had at least 2 years in which consumption declined. We don't know when or if Oregon would exhibit steady beer consumption tendencies, but a prediction of continued growth in beer consumption based on the relationship of a decade of beer sales to time ignores reality.

In addition, a time/consumption trend line can be fitted to the base period data in several ways, and the method can very much shape the estimation of future beer consumption. The analyst must look at the base period data and determine the growth pattern of the base period. If beer consumption seems to be growing at about the same rate each year, then a straight line is fitted to the historic pattern. The estimation of future growth is simply a continuation of the straight line. If beer consumpton seems to be growing at an increasing rate, then a curve is fitted to historical data. The future consumption increases along the curve.

The USBA used the latter method--a fitted curve--to project Oregon beer sales post-1972. Such a curving time/consumption trend line, taken to its logical extreme, would predict that some future year's beer sales would demonstrate infinite growth.

Our examination of the Oregon beer sales data, and of the studies which interpreted that data, lead us to believe that:

--If a projection of beer sales in Oregon must be made just based on the passage of time, a straight line relationship is more appropriate than a curved line relationship.

--The drop in the sales increase in 1973, the first full year after the implementation of the Minimum Deposit Law, can be accounted for by at least two factors other than the law:

(1) The packaged beer container in Oregon in 1972 averaged 12.3 ounces, with the 11 ounce bottle holding 46 percent of the market. In 1973, the average size was 12.0 ounces--2.5 percent less, with the 11-ounce bottle up to 85 percent of the market. This means that if Oregonians had purchased the same number of beer containers in 1973 as in 1972, the volume consumed would have dropped 2.5 percent.

(2) The major switch in 1973 from 12 ounce to 11 ounce containers was not accompanied by a decline in price. In addition, almost all brands went up in price in April-May 1973, apparently unrelated to the mandatory deposit law. 1/ The result of these price changes was to raise the average six-pack price in Oregon from $1.22 in 1972 to $1.30 in 1973--a 6.6-percent increase. When the price change is computed on a per-ounce basis, the increase was about 9 percent.

If a straight line is fitted to the 1961-1972 beer sales data and then used to project the future beer sales in Oregon, the actual beer sales experience is not below the trend. (See table on p. 87.) As noted above, however, a trend line is not very useful if time is the only variable when so many other factors can influence beer purchases.

Because of these problems with predicting what beer sales growth should have been in the absence of a mandatory deposit system in Oregon, we believe that the important result in Oregon is that beer sales have continued to grow, not decline.

Oregon as a basis for reaction to a national mandatory deposit system

Our use of the experience in Oregon after the imposition of its mandatory deposit system as a basis for some of the necessary assumptions was questioned by several reviewers. They believe that Oregonians are not typical Americans because they are more environmentally aware and that Oregon's beverage

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1/This information, as well as the container size data, comes from the October 1974 study by Applied Decision Systems, "Study of the Effectiveness and Impact of the Oregon Minimum Deposit Law," pp. II-76 to 101.

market is also atypical partly because the State is semirural. 1/ They conclude from these factors that Oregon's experience in this area should not be used as a basis for any assumptions about the changes which could be caused by a national mandatory deposit system.

We disagree. For us, the value of the Oregon results is in the reaction of human beings to an economic stimulus, namely a deposit on beverage containers. This reaction is neither dependent on the environmental awareness of Oregonians nor on the semirural character of the State. The people may wear plaid jackets and drive pick-ups but they are still consumers buying, or not buying, beverages; returning them or throwing them away. Studies were done before and after the law went into effect to determine Oregon's beverage sales levels, return rates, and litter levels. Changes occurred in these elements and the changes are the result of the Oregonian consumers' reaction to a mandatory deposit on beverage containers.

We used these reactions, along with other data, to determine what assumptions we should make about return rates, beverage sales, and litter levels. We did not use the Oregon experience to determine assumptions for container mix or capital expenditures. These two elements are not dependent upon the individual's reaction to an economic stimulus but on the decisions of the beverage industry. The Oregon beverage market's experience with container mix and capital expenditures, therefore, was not extrapolated to a national level. In summary, experiences in Oregon which gave indications of the individuals' reaction to a deposit on each container were used but those changes which were the result of the beverage market structure in Oregon were not used.

1/Oregon does have a major metropolitan area of over 1 million people; and in a 100-mile long stretch of the Willamette Valley live 75 percent of the State's population. There is, therefore, some concentration of consumers.

APPENDIX V

The following is a list of industry and private groups and individuals who replied to the draft report.

U.S. Brewers' Association

National Soft Drink Association

Can Manufacturers' Institute

Glass Packaging Institute

American Iron and Steel Institute

Environmental Action

Oregon Environmental Council

Professor Charles Gudger
Oregon State University

Professor Carlos Stern
University of Connecticut

(97126)

GPO 926-282